The Builder.

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Competition Design for the London County Hall ..... By Messrs. Lanchester & Rickards.

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Hydraulics.

CENTURY ago hydraulics was simply defined as "the science of conveying water through pipes or conduits." In the present day we are obliged to ascribe to the term an extended and at the same time a restricted meaning—extended, because hydraulics is really that branch of engineering science which treats of the motion of liquids generally, of the laws by which they are governed, and of the application of those principles in various directions; and restricted, because hydraulics is merely one subdivision of the generic science now described by the term hydromechanics.

That science, which is virtually of modern origin, relates to the equilibrium and motion of fluids both elastic and non-elastic, and therefore applies to gases and liquids alike. It comprises two main divisions—hydrostatics and hydrodynamics, the former being the mathematical theory of the equilibrium of fluids, and the latter the mathematical theory of the motion of fluids.

As the word fluid in scientific language means any liquid or gaseous substance capable of flowing, each division of hydromechanics could appropriately be subdivided into two branches dealing respectively with liquids and gases. So far as purely theoretical study is concerned no such distinction is drawn, but in what might be termed applied hydromechanics we have the two branches of hydraulics and pneumatics, the first applying to liquids or practically incompressible fluids, and the second to gases or compressible fluids. Some writers include the consideration of gases under the head of hydraulics—a practice which is inconvenient in view of the fact that the term "pneumatics" has been in general use for many years. Hydraulics—with which we are now particularly concerned—is sometimes treated as if it were simply the practical branch of hydrodynamics. But since various hydraulic appliances, such, for instance, as the hydraulic press, involve the principles of hydrostatics a limited definition of the kind is not entirely appropriate.

Architects are probably more extensively interested in the preservation of the condition of equilibrium, which is the province of hydrostatics, for upon it depends very largely the stability of buildings founded on water-bearing strata. The development of motion, in accordance with the principles of hydrodynamics, by water contained in strata beneath the foundation of buildings generally leads to trouble. Consequently those who are engaged in architectural construction have good reason for desiring that practical applications of hydrodynamics should not be manifested in an indiscriminate manner. That is one reason, however, why the architect should be familiar with the laws of hydraulics, for knowledge of these may sometimes influence him in the choice of a site, and at other times may enable him to ward off dangers threatened by projected operations likely to disturb existing conditions of equilibrium. Recent action with regard to St. Paul's Cathedral is a case in point. Apart from structural work architects are very largely concerned in matters where hydraulics play an important part, as in the supply of water for and the application of hydraulic machinery and apparatus to buildings. Hence it may be said that the subject of hydraulics is one that comes fairly within the province of all our readers.

One of the most useful guides to this department of science is to be found in a recently published work by Professor Unwin,* who treats in it of a subject which has occupied his attention at intervals for many years, and in whose elucidation he is aided by practical experience as well as by theoretical knowledge.

There is this important difference between the mathematical theory of hydrodynamics as at present developed and practical hydraulics—that in the former the viscosity of liquids is entirely neglected. It is true that the viscosity of ordinary fluids is very small, and, as Professor Unwin says, in many problems may be neglected without sensible error. But in cases where the relative motion of parts of the fluid is rapid it produces very considerable effects, and the results, calculated by theoretical methods, are widely different from those produced in

* "A Treatise on Hydraulics." By William Cawthorne Unwin, LL.D., F.R.S. (London: Adam & Charles Black. 1907.)

actual fluids. The consequence is that the engineer is obliged to adopt empirical methods of computation, based upon simple mechanical principles and assumptions which are modified by experimental constants. In practical hydraulic problems the data furnished by experiments conducted during the past two centuries are chiefly relied upon, and mathematical formulæ are employed mainly for the purpose of reducing to order and intelligibility the mass of observation at disposal.

Two temptations besetting most writers on the subject of hydraulics are either to bewilder the reader with exceedingly complex mathematical formulæ or to place before him empirical details in almost incomprehensible profusion, or to do both. Professor Unwin has steered clear of these obstacles to understanding, while discussing theoretical principles and formulæ in adequate manner and presenting a sufficiently comprehensive and well-arranged selection of experimental data. As in other works by the same author, the diction is perfectly lucid throughout, and there is nothing in the book which cannot be readily followed by the average reader. This is a feature which we are sorry to say is not invariably characteristic of scientific treatises.

After dealing sufficiently with preliminary matters, such as units of measurements, the properties of fluids, and the distribution of pressure, Professor Unwin discusses the principles of hydraulics, which he defines as the science of liquids or incompressible fluids in motion, thus limiting the meaning of "hydro" (ὑδρὸς = watery), and thereby implying that gases or incompressible fluids are relegated to pneumatics—that branch of hydromechanics whose province is clearly indicated by the root "pneuma" (πνεῦμα = breath or air). But in the two succeeding chapters on "The Dynamics and Statics of Compressible Fluids" and "The Flow of Compressible Fluids in Pipes," and in the last chapter on "The Impact and Reaction of Fluids," the author clearly extends the scope of his exposition to the kindred science of pneumatics, and so invalidates the strict accuracy, either of the title given to the book or of the definition ascribed to the word hydraulics. Nevertheless, the comparative treatment of closely-related problems in hydraulics and pneumatics, which is shared by the present treatise and the author's article "Hydraulics" in the ninth edition of the "Encyclopædia Britannica," must in itself be regarded as a distinctly valuable feature, particularly in view of the importance of problems belonging to the last-mentioned subject.

Having considered the fundamental principles of hydraulics proper, and the laws governing the discharge of liquids from orifices, notches, and weirs of various forms, Professor Unwin deals with a few problems of analogous character connected with the discharge of gases through openings, pointing out that in some cases the variation of density with differences of pressure and temperature is so small that it may be neglected without sensible error, while on the other hand it may be sufficiently large to demand attention, and consequently to require the employment of formulæ which are more complicated than those for liquids.

It is interesting to compare the formulæ in Chapter VI. for the flow of air through orifices under small differences of pressure with those given in Chapter IV. for water, and afterwards to make similar comparison of the equations in Chapter VI. for the flow of compressible fluids from orifices when the variation of density is taken into account.

In three subsequent chapters we have a very clear exposition of various theoretical and practical aspects of the flow of liquids in pipes and the distribution of water by pipes. The results of the most recent investigations are stated, together with a method of applying the experimental data so furnished, which we are sure will be appreciated alike by students and engineers. As illustrating the manner in which the author has borne in mind the requirements of practising engineers, we may specially mention the paragraphs dealing with the corrosion and incrustation of water mains, the best means of preventing corrosion and of removing incrustation, the design of iron and steel pipe lines, and the causes of water hammer.

After having once more interrupted the thread of his discourse for the purpose of directing attention to the similarity of problems affecting the flow of liquids and gases in pipes, Professor Unwin takes up two important subjects—the flow of water in open conduits and the gauging of streams. With regard to the former it should be pointed out that, instead of being governed by the virtual slope of hydraulic gradient of the pipe, the velocity of flow depends upon the actual slope of the surface of the water, which is practically parallel to the bed of the stream. Consequently to provide for uniform flow it is necessary that the cross-section of the conduit and its slope should be constant.

For calculating the flow of water in open channels of this kind Professor Unwin gives three formulæ—the Chezy formula, which is the same as that previously stated for flow in pipes, but requiring the employment of special coefficients depending on the size and roughness of the channel; the Ganguillet and Kutter formula, a complicated equation with numerous empirical constants and useless in practical work without the aid of extensive series of specially calculated tables; and the author's form of the new formula based on the investigations published by Bazin in 1897. The last-mentioned rule is of extremely convenient character, and reduces to very simple terms when used in conjunction with the tables given by Professor Unwin.

The gauging of streams is an important detail of hydraulic engineering, particularly in connexion with water supply, irrigation, and power schemes. Operations of this nature generally extend over considerable periods of time, and in cases where a weir is not available, or cannot be constructed for the purpose of accurate measurements, is conducted by determining the cross-section and mean velocity of the stream, the former by careful survey and the latter by the aid of floating gauges or the more refined devices which have come into use during recent years. Various appliances employed in gauging are described by Professor Unwin, as well as the ingenious chemical method proposed by Mr. C. E. Stromeyer. The possibilities of chemical gauging are undoubtedly great, but, as evidenced by the experiments made by Mr. Stromeyer, the method is by no means free from difficulties. For instance, in dealing with the water of large rivers any temporary or local variations in the impurity of the water may upset the accuracy of determinations to a serious extent.

In the case of experiments on the River Wye the salinity of the water varied so much that a very serious error would have occurred if precautions had not been taken to guard against it, but even with such precautions small errors of judgment may affect the accuracy of results to an extent beyond the possible error of the chemical analysis. Moreover, in sluggish streams there is a probability that the chemical solution would sink to the bottom. This disadvantage can be overcome by suitable arrangement of the apparatus, as adopted in the experiments on the River Wye. Those who are interested in the system of gauging here mentioned will find in the *Proceedings* of the Institution of Civil Engineers, Vol. CLX., full particulars of several series of determinations made by Mr. Stromeyer, including some on the New River Intake at Ware, at the East London Waterworks, and at the Salford Sewage Works.

One of the most interesting chapters in Professor Unwin's new treatise is one previously mentioned on the "Impact and Reaction of Fluids"—the word "fluids" being used here in the wider meaning which covers both liquids and gases. The action of jets of water impinging upon trough-shaped vanes, upon solids of revolution, upon planes moving in the same direction as the jet, upon a series of planes interposed in succession before the jet, upon a series of hemispherical cups moving in the same direction as the jet, and of the pressure of a steady stream upon a fixed plane normal to the direction of motion—all afford interesting subjects for the study of engineers engaged in hydraulic engineering and the design of hydraulic machinery. The effects of air pressure upon solid bodies are illustrated in the same chapter by reference to the recent experiments of Dr. Stanton at the National Physical Laboratory, as well as by the previous results of other investigators.

The pressure of wind upon structures is of equal importance to architects and to engineers, and if the concluding pages of Professor Unwin's book do not strictly belong to the subject of hydraulics they are nevertheless of much practical utility, and serve the purpose of demonstrating anew the intimate relation between the subjects of pneumatics and hydraulics.

CONCERT-HALL, NOTTINGHAM.—The erection is now being carried out of the new Albert Hall at Nottingham. The building is to cost over 17,000*l.*, exclusive of site, and will afford accommodation for about 3,000. Mr. A. E. Lambert, of Nottingham, is responsible for the designs.

THE DANGERS OF BUILDING.—II.

THE QUESTION OF ADMINISTRATION.

AFTER the detailed consideration of the proposed building regulations which has recently appeared in our columns, the question of their administration necessarily follows. The Committee answerable for the suggested rules refer to this matter in three paragraphs of their Report (page xiv.). They point out that, although the enforcement of the regulations was not within their terms of reference, and therefore not strictly within their purview, yet it was a subject that had exercised the minds of many of the witnesses, and, therefore, a summary is given of the evidence received. Briefly, it was found that the working-men would object to the principle of the inspectors being appointed by local authorities, as they may be subject to local influence. They would prefer that the officials should be appointed by the Government, that they should be practical men, and have powers similar to those given to the Factory Inspectors.

The employers, on the other hand, did not seem so unanimous in their opinions. Some of them—probably the majority—thought that the Building Inspectors as now appointed locally were the proper persons to assume the duties. One of the reasons given for this was that practical men, as a rule, were appointed to these positions, and that, in accordance with the by-laws, they were advised of all new buildings. Further, in some cases, notably in Scotland, the Inspectors of the Dean of Guild Court already deal with the erection and use of cranes, scaffolds, stages, platforms, barricades, and hoardings, and excavations, so far as the safety of the public is concerned, and it would appear that they have powers of inspection and of prohibiting the use by workmen of unsafe structures. Other master builders thought that inspectors should be appointed by the Home Secretary to districts, and that complaints could be sent to their office, as is the method under the present Factory Act administration. This it was thought would give uniformity to the work, a necessity which was also urged by the workmen. Other employers again, who gave evidence, were strongly of opinion that the Factory Inspectors were the proper men to enforce Factory Act regulations, and that Building Inspectors, if specially needed, should be appointed in the same way as they are. A consensus of opinion obtained, however, among the employers that the Factory Inspectors should inspect the machinery, etc., on buildings in like manner as they now inspect machinery in builders' workshops.

Now all these opinions contain points which are not entirely antagonistic.

There is an implied agreement in the first instance that inspection is necessary, and an expression given by both masters and men that uniformity in the methods of inspection is desirable. The greatest difference of opinion occurs when the question is considered as to whether the inspectorate should be created by the Government, presumably by the Home Office, or whether the already appointed Building Inspectors who own the different local authorities as their employers should have these duties added to those already carried out by them. The workmen strongly object to this latter proposal on the grounds already given of their being open to local influence. This is a charge that has been often levelled against most local officials, and the impermanence of many local appointments, by making the holders dependent to a large extent upon the goodwill of those forming the authority under which they serve, gives ground for some belief in its truth. Many instances could no doubt be cited of individual cases which would give point to this accusation, and it is no doubt undesirable that any body of men, however well intentioned and sufficient in integrity personally, should be entrusted with the enforcement of regulations governing risks to life and limb, and which it may be impossible for them to carry out fully without ill consequences to themselves. On the other hand, there are arguments in favour of the locally appointed inspector which are pointed out by some of the employers. As is well known, the commencement of a new building or of important structural alterations to one already erected is known to a local authority by reason of their passing the necessary deposited plans in the earliest stages, and therefore the local inspector would know of and be ready to inspect any building from its commencement. This argument is, however, not so forceful as might be imagined. At present under the Factory Act, upon a builder setting up a workshop, and whether machinery is used in it or not, it is necessary for him to acquaint the District Factory Inspector of its existence. Surely it would be no hardship for him to notify in like manner to the same official that he was commencing a building or its repairs to which any Factory Act regulations would apply. Again it is necessary that the local authority, through the Medical Officer of Health, should notify the Factory Department of certain workshops that come to their notice. Could not this principle be extended so that the Surveyor to the local authority in like manner would send notice of any new building operations that were commencing in his district? If either of these two methods were adopted, or, to prevent any oversight, both were put into operation, the great argument in favour of the local inspector would largely fail. Certainly it can be urged in their favour that they are practical men, but the Home Office, if deciding to accept responsibility in this matter, can meet this objection by appointing men similarly trained. This perhaps requires some qualification. The Building Inspectors locally appointed are essentially practical men, and have not, as a rule, any further recommendations. After reading the proposed regulations it must be apparent that structures considered unsafe as a whole are not specially dealt with, and it was doubtless considered by the Committee that, in the event of such dangers occurring, they could best be dealt with, as one witness pointed out, by procedure under sect. 17 of the Factory Act. This section provides that when any works, etc., are found dangerous to life or limb an order can be applied for from a magistrate prohibiting the use of the works until the defects are remedied. This calls for greater knowledge, both of scientific building and legal procedure, than is usually possessed by Building Inspectors. It follows, therefore, that while men are required who have a practical acquaintance with buildings, their general knowledge should be of a higher standard and more varied character. Such men are not difficult to find, and it is amongst such that the new inspectorate should be sought. One argument against Government appointment does not seem to have been mentioned by the witnesses, and that is the annoyance to the builders of dual inspection. It is an argument that has weight in these days when we are inspected for apparently all sins of omission and commission, but as the demands of these regulations require the appointment of a highly-trained official, and as it is not to be expected that at least the smaller local authorities would appoint men of such a standard, the needs must outweigh the annoyance.

With regard to the powers exercised by the Dean of Guild Court, and which are apparently conferred by the Burgh Police (Scotland) Act, 1903, further information is necessary. If these powers are exercised for the protection of the public only, their scope hardly concerns the present issue. If, on the other hand, the powers conferred do protect the workman, it would be interesting to know to what extent they are used. So far as the protection of the public is concerned, a number of local authorities in this country have similar powers, and no doubt they are enforced. But the safety of the public is not on similar terms with the safety of the workmen, and, lacking a serviceable argument otherwise, the two necessities should be viewed apart.

Another opinion put forward that inspectors with an office and controlling a district should be appointed so as to ensure uniformity in the work seems either incomplete or somewhat illogical. If the regulations as finally drafted apply equally to the different methods of building wherever carried out, surely uniformity of action, assuming, of course, that they were carried out with the necessary strictness, would result, because of the regulations and not because of the controlling power. In this respect the argument behind the opinion seems to fail. If, on the other hand, resolute action on the part of the officials is to depend upon the degree of necessity as imagined by those responsible, then it would seem better that the power should be in the hands of a central authority working through its representatives. The idea of many masters many minds is one to be avoided in such matters as these.

The suggestion that the Factory Inspectors as they now exist should have the duty of inspecting the machinery, cranes, etc., on buildings in the same way as they now perform similar duties in builders' yards, is not a good one. If a different inspectorate is appointed for the scaffolding proper it would mean dual inspection from possibly one department. Such an arrangement is open to many charges, waste of public time and money being not the least important. There should be no difficulty in finding

men who could in all ways carry out these regulations as they stand.

A member of the Committee, Mr. McFarlane, in a memorandum attached to the Report, gives his individual views on this matter. He favours the idea that the locally-appointed Building Inspectors should carry out these duties. He points out that these men should act under the control of the Borough and County Architects and Surveyors. Then he thinks a Government Inspector should be appointed to large areas, whose duty it would be to supervise the work of the local inspectors, and to whom complaints could be sent and matters in dispute referred. There is much to be said for this suggestion, but no account seems to have been taken of possible divergent views between the architect and surveyors and the Government Inspector, and which might result in a deadlock of administration. Even if the Government official was given the authority to decide on all issues, nevertheless possible friction would have to be considered. Taken generally, this idea seems worthy of further consideration if only from the fact that the Government supervision would largely minimise, if not entirely extinguish, all possibilities of the local influence already referred to.

Mr. McFarlane also supports his view with the opinion that his suggestion could be worked with economy and efficiency. Both are necessary; false economy must, however, be avoided, but would certainly result if efficiency should be impaired by the lack of sufficient inspectors, or if the men appointed did not reach the standard of excellence required.

NOTES.

The Technolexikon. In 1901, when the announcement was made that the German Society of Civil Engineers had commenced the compilation of a technical dictionary in German, French, and English, many people rejoiced in the thought that they might before long be in possession of a thoroughly reliable work of the kind. After bravely continuing their efforts for upwards of seven years and expending the sum of nearly 25,000*l*., the Society have reluctantly come to the conclusion that the task was too great for the financial resources at disposal. What will be done next we do not know. Engineering societies are not usually very liberal in supporting undertakings for the general benefit of the profession, and Governments are apt to look for individual national benefits in return for the expenditure of public money. Therefore the prospects of financial aid are not so hopeful as could be desired. But it would be a thousand pities if a work of such international value were allowed to drop, especially as so much has already been done towards its realisation.

The Planet Mars. On Monday last Mr. Arthur R. Hinks gave a lecture at the London Institution on "The Evidence for Life on Mars." As we expected, it was a kind of counter-blast to the lecture on the same planet delivered there some time ago by Mr. Walter Maunder, and reported in our columns at the time. After showing how Mars was the only planet, except the Moon (which was manifestly *hors concours* in respect of Life), of the solid surface of which we could really get a telescopic view, Mr. Hinks proceeded to argue, by the analogy of a diagram of the meandering line of a Cambridgeshire river as compared with the two straight lines of artificial water-courses connected with it, that artificiality of appearance in details on the surface of the planet was the only means of concluding on the existence of intelligent beings on it. Natural features, as far as we knew them, did not tend to run in straight lines. Mr. Hinks, who lectured with great clearness and fluency, supported Professor Lowell and Schiaparelli so far as to maintain that they did see what they said they saw, and rejected Mr. Maunder's argument that the *canali* were optical illusions, as well as his method of supporting it by the drawings of children. We do not think this point is settled yet. It must be remembered that such delicate markings as Professor Lowell describes, if they are there, can only be seen at all during fortunate moments of exceptional clearness and steadiness of our atmosphere; they cannot be studied deliberately like a chart, nor can they be photographed to any purpose, not only for the reasons Mr. Hinks gave, but for another which he omitted to mention, viz., that Mars is turning on his axis at the rate of once in 24½ hours, and therefore a long photographic exposure, which might bring out unsuspected details, is impossible. His conclusion, however, was moderate and reasonable enough:—That whatever the facts as to the existence of the straight channels on Mars, they do not prove the existence of inhabitants. If admitted, they only prove that, if not artificially made, the natural scenery and configuration of Mars must be very different from anything we are familiar with on the surface of the Earth.

Board of Education Science Examinations. In their official Report for 1907 the Board of Education publish sections of the Reports made by the examiners in seven branches of science, the remarks upon numerous typical examination questions in the various groups being of much service for the guidance of those who are engaged in teaching work under the Board. In several of the subjects included in the Group II. Engineering there are signs of notable improvement, while in others the standard of the previous year was not maintained. The examinations in Building Construction, Stage I., showed gratifying improvement, but in Stages II. and III. most of the students exhibited a lack of practical knowledge. Applied Mechanics and Practical Mathematics also proved stumbling-blocks to many of those who entered for the examinations. As usual in Reports of the kind we read that many candidates had evidently acquired a certain familiarity with facts and rules, but evidently failed to grasp fundamental principles and the manner in which theory should be applied to the solution of practical problems. Taken generally, the criticisms of the examiners are fair, and will be welcomed by teachers whose sole aim is to improve the standard of technical education in their classes, and to encourage habits of observation and practical thought among their students.

Board of Education Art Examinations. The Report of the Examiner in Architecture (Mr. Elsey Smith) to the Board of Education is favourable on the whole to the students. In the examination in Classic architecture it is noted that the drawings of classical capitals were mostly well done, but that the demand for a scale section of a Corinthian or Composite cornice met with a very poor response. Many students (and amateurs) are familiar with the forms of Classic capital, who never think of the cornice. The question, "draw the plan, elevation, and section of a building that you have personally visited and studied" is reported to have been very well answered; we presume the drawings were from memory; nothing could better promote intelligent study of buildings. Memory drawing of plant form is commended by Mr. Paulson Townsend. In the design of ornament the Examiners (Messrs. Townsend and Erat Harrison) say that "the impression among students that a floral device is an answer to *any* question is evidence that in many schools but little, and in others no instruction is given in scroll or geometric design." The inference seems to be that the students do not realise the importance of clean and distinct main lines in ornamental design.

Motor Driving. The remarks made by Mr. Justice Bigham in sentencing a chauffeur to six months' imprisonment with hard labour for driving at an excessive speed in a crowded thoroughfare in Pimlico and causing the death of a woman should be noted by motorists. The learned judge pointed out that in the handling of these large and dangerous vehicles a greater degree of responsibility attached to the driver than in the case of better understood and less alarming horse vehicles. He also indicated that wheeled vehicles do not possess an exclusive right to the middle of the roads, but that pedestrians have equal rights. In this case the chauffeur was apparently driving the car on his own business or pleasure, and he was the only person responsible, but when the owner is present and aids and abets in reckless driving he is the person who should be punished, and prosecutions are too often only directed against the chauffeur.

The Barnsley Disaster. How far special blame can be fixed on any one for the dreadful disaster to children at Barnsley can only be estimated, of course, after the evidence in the inquest is complete. As far as one can judge from description in the papers, the staircase seems to have been ample in width but with a good many turns and angles. One obvious lesson, however, both from this and from the still more tragical disaster at Sunderland a few years ago, is that crowds of children turned into a building require careful supervision and guidance by older persons at every point in access to or exit from a building.

Warm Houses.

THE Englishman who congratulates himself that as a rule he lives in a temperate climate, has cause to regret it when a snap of real winter occurs. Then he exists in a state of far greater discomfort (often injurious to health) than the person who dwells in a land where the winter climate is habitually severe. The wonder is that in these days householders do not guard against severe weather by means of the numerous excellent and cheap stoves which are now to be found. Gas stoves in various parts of the house, or oil stoves in passages and rooms, are powerful agents to raise the temperature. An oil stove is cheaper than a doctor, for cold houses are the cause of many illnesses. Even in winter, when the thermometer is not below freezing, there is often a considerable amount of cold damp in an English house which can be dispelled by the use for a short time of one of the above appliances. But with many persons habit is a second nature, and not a few have got into the habit of suffering from the cold as if there was no alternative to discomfort and illness.

Houses of the XIIIth Century.

INFORMATION regarding the dwellings and people of past ages is generally interesting, and when it is imparted partly pictorially and partly by the utterances of an able lecturer, it can be made quite absorbing. The lecture on "Houses of the XIIIth Century," delivered by Mr. C. H. Bothamby on Thursday last week at St. James's-square, S.W., before the members of the Blenheim Club (with which is amalgamated the Camera Club), was all that such a lecture should be, for not only were the remarks of the speaker full of interest, but a number of beautiful lantern views were shown of the buildings referred to. The lecturer, who omitted the big castles of the period which have come down to us, said it was often supposed that there was little material for such a lecture. As a matter of fact we have in this country a considerable number of XIIIth-century houses which are to this day practically complete, and, as far as one can tell, they have been inhabited continuously since the time of their erection—more than that, there are a considerable number of XIIth-century houses belonging to the Norman time. In the City of Lincoln there are three Norman houses of the latter part of the XIIth century, two of which are inhabited. In Southampton there are, or were until recently, substantial remains of four houses of the XIIth century, and there are others up and down the country. Of course, these houses and those of the XIIIth century which we possess are larger and a better class of house than those of the common people, who in the Norman times occupied quite small houses of wood and plaster covered with thatch. It was only where people were of some importance that their houses were built of stone, and these houses, which were not castles and not always manor houses, were the houses the lecturer dealt with. Mr. Bothamby traced the evolution of the plan of such buildings—from the one large living room or hall, with one or two cut-off apartments, or solar, to the more complicated plans of later times. He showed and described several buildings of the XIIIth century, and gave quite an exhaustive account of Stokesay Castle and Little Wenham, in Suffolk—once used as a granary and fowlhouse, but since very judiciously restored. In the course of his remarks he said that the licence to crenellate did not indicate the beginning of the work of building, but the finish very often—and probably that is so; or the finish of some part and the commencement of another part.

The Leicester Gallery.

THE collection at the Leicester Gallery of the landscapes in oil by the late Henry G. Moon is a revelation to us of a gifted English landscape painter whose work during his lifetime seems to have been unknown to any but his friends. Moon painted, in a sense, as an amateur; he did not make his living by landscape-painting, but by coloured drawings of flowers for horticultural illustrations. His landscape work was obviously much influenced by Corot; but he had a style and handling of his own, and was no copyist. The little sketch, No. 3 in the hanging—"Sands, Palling, Norfolk," at once arrests the attention as a little masterpiece, small and slight as it is. There is not a picture in the room without merit and interest. Among the finest are "The Sandhills, Palling" (15), with old cottages in the foreground; a powerful work which owes nothing to Corot. Among other good examples are Nos. 29, 30, 48, 49, 51, 56; and more especially we may mention "Cottage, Holywell" (59), for its fine sky, and "Evening Light, Stanboro', Hatfield" (60); this latter is very like a composition by Corot, though the method is different. It is rather an artistic event to come upon an unknown landscape painter of such interest. At the same Gallery is an exhibition of water-colours of Venice and Holland by Mr. Wynne Apperley; effective sketches in a broad style, but which are rather put out by the Moon collection; and Mr. Rackham's original drawings for "Alice in Wonderland." Almost everyone has already seen the reproductions of these in the new edition; the originals of course look better and are full of splendid workmanship and grotesque fancy; but as illustrations of the story we think Tenniel's still keep their place.

The Baillie Gallery.

WE are not always in sympathy with what we find at the Baillie Gallery, which, like the Carfax Gallery, tends too much to be the home of eccentricities. But the collection at present on view there is somewhat exceptional. The larger room contains a collection of etchings and other works on a small scale, of unusual interest. Among them are a beautiful little etching by Sir F. Seymour Haden (1); colour studies of animals by Messrs. Maurice and Edward Detmold; etchings by Miss Mary A. Sloane—"The Stockinger" (11), an interior, is admirable; two or three beautiful mezzotints by the late J. Finnie; etchings by Sir C. Holroyd, of which Nos. 36, 37 are especially good; by Mr. Lawrence Walker; by Mr. Martin Hardie, a new associate of the Society of Painter Etchers, whose etching of "The New Entrance Hall, Victoria and Albert Museum," before the timbering was removed (61), looks as if it came from some Oriental source; and etchings by Mr. W. Monk, whose "Market Hall, Amersham" (64), is a powerful little architectural picture. Mr. Stephen Simpson's collection of water-colour drawings under the title "Sunshine in Greece, Italy, and Albania," bears out the title as to the sunshine effect; the drawings deal mostly with architectural subjects—ruins of Greek temples, etc., not all equally well treated; but some are very effective. Miss Colman Smith exhibits a new set of her ideal drawings suggested by music—"visualised music drawings"; there is an element of fancy in these that makes them always interesting. She has two new ones of the C minor Symphony, which however are not so expressive as the one in the first collection. But it is an original idea in art, though perhaps it would only appeal to those who are familiar with the compositions symbolised.

Bournemouth Municipal Buildings.

IN our issue of December 9, 1905, we published an exceptionally fine design by Mr. C. E. Mallows for the proposed Municipal Buildings for Bournemouth—one of the finest modern architectural designs we have ever seen on paper, and which we earnestly hoped would be carried out. The subsequent history of the matter is unfortunate, to say the least of it. The Bournemouth authorities commissioned Mr. Mallows to make the working drawings, but subsequently threw over the scheme, paying the architect for the working drawings. Now, however, it is announced that, after having done this, they intend to advertise an open architectural competition for the building. If this is not unfair to Mr. Mallows, it is unfair to themselves and to their ratepayers. It is not in the least likely that a competition will produce a finer design than Mr. Mallows's, or even as fine a one; they are therefore throwing away an exceptionally fine architectural opportunity, and at the same time wasting the ratepayers' money which they have already paid to their original architect, besides incurring an additional and needless expense in promoting a competition. It is a matter which some of the more enlightened and public-spirited inhabitants of Bournemouth would do well to take up.

ROYAL INSTITUTION LECTURES.—Sir David Gill concluded on Thursday last week his series of six lectures on Astronomy, treating in it of stars, nebulæ, and comets. He dwelt a great deal on the use of spectrum analyses by means of the prism, in determining both the composition of stars and nebulæ, and detecting the movement of a star parallel with our line of vision, when change of position cannot be ascertained by direct observation, as in the case of a star moving to right or left of its visible position. The demonstration was such as is familiar to all who have paid any attention to modern astronomy, though it must have been above the heads of some of the youthful audience, from the question overheard from a child coming out after the lecture—"Mother, why do they put the spectres in prison?" Several of the audience had, at the lecturer's request, made copies of a picture of Mars which had been exhibited, and Sir David Gill remarked that though there were no canals in the original they appeared in the copies. The fact is, we suppose, that the "canals" of Mars have been such a subject of talk lately, that all good boys know that they ought to be there, and draw them accordingly.

D

THE AQUEDUCTS OF ANCIENT ROME.—II.

By Dr. Ashby, Director of the British School at Rome.

Of the first portion of the Anio Novus there are very few remains above ground; it seems to have followed the left bank of the Anio, and it is probable that a portion of its channel is visible above Subiaco, close to the Ponte di S. Mauro.* Canina, who takes this to be the beginning of the aqueduct proper, making the lowest of the three lakes extend from the Ponte di S. Mauro to this point (*Edifizi*, v. 140, vi. tav. 140), speaks of other remains, and Fabretti mentions traces of arches a little below the town; but these I have not seen, though I have not as yet had the opportunity of following the left bank of the river, as both the road and the railway keep to the right bank.

Shortly after the crossing of the latter to the left, in a side valley to the north-west of the village of Marano, I thought I saw remains of arches, which no other writer indicates; but this portion requires further examination. The point is almost opposite to the springs of the Marcia and Claudia. A mile further on are remains which have been connected with the aqueduct by some writers, though to me they seemed to belong to a villa; and two miles further on again the Staff Map marks "Ruderi di Ponte Arconi." Fabretti (*De Aquis*, Diss. ii., tab. 1, num. 10) marks a bridge at this very same point, of which I have never seen traces. He conjectures that it carried the Anio Novus from the left to the right bank of the river,† but this idea is certainly erroneous. Even if it were from right to left, this would argue another crossing higher up, and the reason for it is not clear. In any case the channel of the aqueduct was found quite recently (in making the new railway to Subiaco) a little further along the left bank. It was cut in the rock, but lined with cement; the width was 1·20 metre, and it had an arched top about 2 metres below the level of the line; the direction in which it was running was 36° west of north.‡

The next traces of the aqueduct do not occur for another two miles, to the south-west of the railway station of Cineto Romano; here, however, considerable remains of substructions in concrete begin to be visible, following the hillside only a little way above the river level, and can be traced, with intervals in which the aqueduct remained entirely underground, as far as S. Cosimato. The bridge over the mouth of a stream known as the Fiumicino, opposite Mandela station, must have been of considerable length, though of no great height. The concrete is faced with brick, or, in some cases, with small rectangular blocks of stone cut to about the size of a modern English brick.

Rather less than a mile lower is the monastery of S. Cosimato. The gorge below this is the probable site of the intake of the Anio Vetus, though no actual traces of this can be seen in the stream bed§; and here we come to the first point of real difficulty in the determination of the respective aqueducts. But before we go into the problem, it may be well to notice briefly the remains of the Marcia and Claudia. The springs of these are, as we have seen, on the right bank of the Anio, about a mile north-north-east of the village of Marano. Many remains of the channel of the Marcia have been noticed and mapped by the engineers of the modern aqueduct, and are described by Lanciani, *op. cit.*, 280, 287.

In 1890 excavations led to the discovery of the channel of the Marcia, which was of concrete, 2·70 metres in total height, 1·52 metre in width, with a vaulted roof 0·60 metre in height from the impost. Close by it was found a *cippus*, still in its original position, bearing the following inscription which may be given here as typical of the rest:—

MAR
IMP. CAESAR
DIVI. F. AVGVSTVS
EX. S. C.
MCCXV. P. CCL.

that is to say—*Marcia. Imp(erator) Caesar Divi [Iuli] f(ilius) Augustus ex s(enatus) c(onsulto) mccxv. p(edes) ccl.* *i.e.*, Marcia. Erected by the Emperor Cæsar, son of the deified Julius, Augustus, by decree of the Senate. No. 1,215, distance from the next stone, 250 ft. (*Notizie degli Scavi*, 1890, 164, and *Corpus Inscript. Lat.* vi. 31,562).

This *cippus* has an interest of its own; it shows, as do a few others, that the interval between the *cippi* was not invariably (though it was in most cases) 240 ft., and that, therefore, it was not possible to calculate exactly the length of the aqueduct by multiplying 240 ft. by the number which each stone bore. There are too many exceptions to allow us to suppose that there is simply an error in the number here (see *C. I. L.*, vi., p. 3,124, where the other exceptions to the general rule are quoted). One of them is the 901st stone of the Anio Vetus, found in the locality known as Cassiano or Carciano, a little to the south of Tivoli, while the rest are *cippi* found within Rome itself.

The high number (1,215) is due to the fact that the reckoning began in Rome, and not at the springs. One other, with a still higher number (No. 1,242) was seen by Fabretti close to the point of divergence of the modern roads to Subiaco and Arsoli, but not in its original position; while No. 1,197 was found *in situ** (Lanciani, *op. cit.*, 280) at a distance of 1,030 metres from No. 1,215. This distance, however, gives an average of only 192·33 Roman feet for each interval $\left(\frac{1030}{18 \times \cdot 2975}\right)$ which shows that some of the intervals must have been a good deal less than 240 ft., though this is, as has been said, the usual amount. For we cannot here suppose that the aqueduct pursued a sufficiently winding course to bring the length up to 240 ft. for each interval; such a hypothesis is forbidden by the fact that it here follows the road, which runs practically straight between the Anio and the mountains, rising precipitously on the north-east. The question of the relation between the lengths of the aqueducts as indicated by the inscriptions—in the case of the Anio Vetus and Marcia, by the *cippi* erected by Augustus (which were never, as far as we know, renewed or substituted by others by any later emperor), and in the case of the other two, by the inscriptions of Claudius† on the great double arch now known as Porta Maggiore, close to the point where they reached their terminal cisterns—as given by Frontinus, and, as traceable by the actual remains, is by no means an easy one. The last measurement can only be approximate, and hardly even that; but I give it in order to show that, especially in the case of the two earlier aqueducts, though far less in the case of the two constructed by Claudius, a very tortuous course was pursued, in order probably to avoid the expense of large bridges, to reduce the impetus of the water, and also, we need have no doubt, in the case of the Anio Vetus and Marcia, to keep the aqueducts concealed, and therefore less exposed to interception by an invading army. It must also be remembered that in Frontinus' time the course of the two earlier aqueducts at least had very likely been abbreviated by repairs and improvements; while, with regard to the Claudia, we have a difficult problem in connexion with the course originally pursued by it, which we may best discuss below.

Our results may be shown in tabular form (measurements in kilometres):—

Measurements in Kilometres.

——	Anio Vetus.	Marcia.	Claudia.	Anio Novus.
Inscriptions	45·82 (from *cippus* 645) thence to springs 26·10 km. direct	86·31 (from *cippus* 1,215) hence to springs, about 3 500	66·6* (45 miles)	91·76* (62 miles)
Measurements given by Frontinus	63·7	91·4	68·75	86·9
Approximate measurements based upon existing remains	55·6	69·4	63·8	79·8

* It is hard to take proper account of the windings of the aqueducts, inasmuch as no maps larger than 1 : 25,000 are available; but the difference between the approximate measurements and those given by Frontinus and the inscriptions shows that these windings must have been very considerable.

Upon these we may remark:—

(*a*) That Frontinus' measurement (and the approximate measurements also) must relate to the abbreviated course of the Anio Vetus.

(*b*) That he is measuring the old line of the Marcia, which must have been extremely tortuous, though that of the Anio Vetus must have been even longer.

(*c*) That it would appear, from the close correspondence of measurements, as if the Claudia had always followed the same line, the saving effected by the tunnel under the Monte Affliano being nearer 5 than 2·15 kilometres—the difference between the length given in the inscription and that given by Frontinus. On the other hand, the inscription recording the construction of this tunnel speaks of it as a new work. Albertini in *Mélanges de l'École Française*, 1906, 310, considers that the difference is due to the fact that Frontinus is measuring from a spring further up the valley, the *fons Albudinus*, while the measurement of the inscription is taken from the springs mentioned in it, the *fons Curtius* and the *fons Caeruleus*.

(*d*) That the difference between the measurements given for the Anio Novus by the inscription and by Frontinus respectively is hard to explain. Trajan's change of the intake increased, as we have seen, its length, whereas we find the figure given by the inscription *higher* than that of Frontinus. And the only solution that Albertini can find is to suppose that the inscription originally agreed with Frontinus' indication, and was corrected by Trajan after he had lengthened the aqueduct (*op. cit.* 315). He points out that this could have been done by changing one stone only on each side of the frieze of Porta Maggiore.

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* See Giovannoni in *I Monasteri di Subiaco*, Rome, 1904, i. 280, n. 3.

† The original text has "from right to left," but the description there is going upstream. I quote the 2nd (1788) edition, as the original (1680) is rarely met with.

‡ I mention these details only because, as far as I know, I am the only person who has observed them. The *Notize degli Scavi* is silent on the point, and I do not suppose that the aqueduct has been left visible, as it was on the edge of the railway.

§ Canina, *Edifizi*, v. 140, says that he saw remains of the intake at the mouth of the Fiumicino, but I was unable to detect them.

* The other *cippi* found as far as Tivoli were none of them *in situ* except perhaps No. 945, and of this the exact position is not given; they bear the numbers 1152, 960, 945 (see *C.I.L.* vi. 31,562).

† *Corpus Inscript. Lat.* vi. 1,256.

Business Premises in the City.—A new building, to be known as Orient House, has just been erected in New Broad-street. It was designed by Mr. Ernest Flint, architect, and the work was carried out by Messrs. George Trollope & Sons and Colls & Sons, Ltd.

MAGAZINES AND REVIEWS.

In the *Burlington Magazine* the Editor completes his suggestions for the treatment of Westminster Palace decorations. He assumes that if the Royal Academy would contribute from the Chantrey fund 2,000*l.* out of the 4,000*l.* a year assumed to be necessary to carry on the work, they would have the right to nominate half the artists in the competition. A beginning might be made by selecting twenty-four artists, twelve chosen by the Academy and twelve by outside societies; then the *modus operandi* would be as follows:—

"Assuming, then, that twenty-four artists were thus chosen, might they not each be asked to furnish a rough sketch, not exceeding 6 ft. square, of some given subject suitable for the decorative work in hand, with, perhaps, a complete study of one of the heads carried out on a larger scale, and in the range of tones appropriate to decorative work of which we spoke in our first article? If necessary, a nominal sum might be paid to each artist in consideration of the time and trouble spent in preparing this sketch and study. The sketches and studies, after being exhibited in the artists' respective societies, should be hung together, say in one of the large rooms of the Tate Gallery, where there would be every opportunity of public and private criticism.

Then the actual giving of commissions would begin."

When these twenty-four had completed their work there would be the opportunity for another twenty-four to be elected. All this would work very well, but for an initial difficulty—that the Royal Academy can have no legal power to appropriate the Chantrey Fund for such a purpose, which is entirely at variance with the conditions of the bequest. A large part of the number is occupied by illustrations of works of art—pictures, furniture, and other works, acquired by one purchaser, Mrs. C. P. Huntington, from the collection of the late Rodolphe Kann.

In the *Art-Journal* Mr. E. C. Clifford commences a series of articles on "Nature-Study" considered from the point of view of a landscape painter. The drawings which illustrate the articles will be made from subjects having distinct characteristics that should be noted by the student of landscape—trees, plants, foreground, flora, fauna, and conspicuous insects. The writer deals in the first article with "woodlands," not forgetting some of their denizens. There are some good illustrations, including a view in Sherwood Forest by A. Maccallum, a fine painter of forest scenes who has been rather forgotten. Mr. Alexander Millar contributes a paper on "The Making of Carpets," than which, he says, there is no branch of art manufacture in which the thought and labour upon design bear such a high proportion to the total output of the actual fabric. He deprecates the old South Kensington attitude, which was to "take one of our gold medallists and give him a salary to design for you," and urges that a man with artistic ability who has first worked at the making of carpets would be much more likely to express his ideas "in terms of manufacturing conditions"; in which conclusion we have no doubt he is right. An article on the work of Sir John Gilbert, by Mr. C. Collins Baker, shows us (in the illustrations) the late artist in a new light—not as the painter of rather florid Mediævalism, but as the author of a number of charming little sketches of village scenery; he is also illustrated by a separate plate of his graceful painting of a girl, "The Old Scrapbook."

In the *Architectural Record* (New York) Mr. L. R. Smith gives the fifth chapter, and the last, on the interesting subject of Haussmann's "Transformation of Paris under Napoleon III." This chapter deals with the parks and pleasure-grounds. In regard to the Bois de Boulogne it is curious to find, from the companion plans of it before and after transformation, that Haussmann and Alphand (who assisted him) did with it exactly the contrary of what was at the very same time being done with the streets. The system of radiating straight streets and *rond-points*, which we find in the Paris of to-day, was entirely followed in the old Bois de Boulogne, and Haussmann swept away all this to make it a *parc Anglais*, with undulating drives and a generally more natural appearance. The reason suggested is that the formal arrangement, suitable as long as it was a Royal *demesne*, was not suitable when it became a park of the people. The article sketches the history of the other Parisian parks, and gives a number of illustrations both of park plans and Paris buildings—the Opera-House, the Palais de Justice, etc. The author defends Haussmann from any charge of selfish egotism. His schemes for Paris were ambitious, but he was "a simple-minded French bourgeois whose wants were few and his manner of life simple." He did not enrich himself, though he evidently might have done so. The portrait given of him is distinctly attractive, and answers to this idea. The author seems a little at sea in his French; he spells a great sculptor's name "Carpeux," and quotes Zola's "La Curée" as "La Currée." But he has made an important contribution to the history of modern Paris.

Among other articles in an excellent number is one on the triumphal arch as "a National Emblem of Liberty," by Mr. Frothingham, with a number of illustrations; but we do not understand the title; an arch is a fine form of memorial, but it has generally been associated with conquest rather than with liberty. The ceilings in the Uffizi Gallery are illustrated in an article by Signor Melani. Then there is an article, which we are glad to see, on a very important practical subject, "The Evil Effects of Competitive Bidding on Building Contracts:" what we call competitive tendering. We agree with it entirely. The author, Mr. G. C. Nimmons, asks "Does our present system of letting contracts by competitive bids result in securing for the owner the lowest obtainable cost for a building, consistent with good workmanship?" We have long been of opinion that competitive tendering is one of the great evils of the day, not only inimical to honest building but to good architecture, and we are glad to find it questioned by a writer who is we presume an American architect. In regard to one particular kind of building, he says:—

"I wish to refer to the comparatively new problem of letting a contract for a reinforced concrete building. This new kind of structure, may be successfully built, with a reasonable degree of safety, provided that it is properly designed, and carefully and conscientiously constructed. Yet if any one of the many important parts of this building is slighted, or if the contractor, or even one of his workmen, undertake to apply any money-saving economies, or rush-methods of the ordinary building, the inevitable penalty is awful. The builder or the workman is liable to answer for it with his life. Here is a new feature in the problem, that will surely receive a hearing at the letting of the contract. It will soon become evident to the public, if it is not already so, that competition only on the basis of cost cannot with safety be entertained for a concrete building. Those sterling qualities of character in a builder on which so much depends for the excellence of the work, will receive a new and higher appreciation. A builder's ability, his integrity, his loyalty, his skill, his aptitude for his work, will again be put at a premium as these qualities used to be in olden times."

And the latter part of these remarks surely might be held to represent the best conditions in respect of all kinds of building. It is significant that this article is immediately followed (whether intentionally or accidentally) by one on "Shoddiness of American Building Construction," by Mr. F. W. Fitzpatrick. Speaking of this he says:—

"Shoddy construction, like most other sins, is serious in itself, but still more so in its effects and what might, flippantly but expressively, be termed its 'side issues.' One of its most important controlling factors is the desire of some builders to make undue profits; these men have encouraged and still encourage slovenly, incomplete, shabby work on the part of their employees—therein lies the profit—these get into the habit of doing that kind of work, the contagion spreads and to-day, as a nation, while we are noted for our ability to do many excellent things, the general character of our labour measures up to a deplorably low standard. More than that, the shoddiness that initially was injected into our buildings for illegal, immoral reasons, has left its marks on our laws as well as upon the 'yielding of our labour'; at some time or another it was winked at by the authorities or permitted under too lenient and lax regulations, until it actually became the gauge by which all things were measured."

In this respect it would seem the States are in a worse condition than we are; for if there is a deplorable amount of jerry-building in England, our building law at least does not encourage it. Nevertheless the actual standard of building execution with us would be much higher if it were not for the system of competitive tendering.

The *Architektonische Rundschau* has a special article on Prussian village churches, with various illustrations in plates and text. These are old churches, simple and unassuming in their quiet architecture, and very different from modern German efforts after the picturesque.

In the *Berliner Architekturwelt* the illustrations of the Hotel "der Fürstenhof," by MM. Bielenberg and Moser, show a great deal of curious and original architectural detail, very clever, though some of it is rather fantastic.

The *Quarterly Review* contains a very well written and impartial article on "William Blake" by Mr. Sturge Moore, who can appreciate Blake's genius without going into exaggerated panegyric. We do not think, however, that the horses in the "Canterbury Pilgrims" can be defended; they are stiff and destitute of movement; it is curious that an artist who could express movement so well in sketching the human figure should have failed with animals, which he seemed only able to treat in attitudes of repose and in a kind of conventional decorative manner (see the marginal drawings of cattle in some of the "Book of Job" illustrations, for instance). But the article is a good one, and should be read by those interested in Blake. It deals, of course, with Blake the man and the poet as well as Blake the artist. The same issue contains an article on "Greek Temples and Early Religion" by Professor Bosanquet, to which we may return; but as the copy of the *Quarterly* only reached us at the last moment before going to press it is impossible to go into so large a subject on this occasion.

The *Nineteenth Century* contains an important and interesting article by the Rev. H. V. Gill, a well-known scientist, on "Some Recent Earthquake Theories." The main point in the article is that in considering the causes of earthquakes the earth is often treated of as if it were a stationary globe in space, without taking any account of its revolution on its axis as affecting the relation and balance of its materials. And he argues that the displacement of matter by a serious earthquake may amount to so much disturbance of equilibrium as to cause a shifting of the poles; while on the other hand, the shifting of the poles, which (from whatever causes) is known to take place to a considerable extent, may have a re-acting effect in causing strains in terrestrial structure; moreover, that an extensive earthquake in one place may be the cause, by disturbance of equilibrium, of another in another part of the planet. Mr. Gill does not hold out any hope of arriving at the degree of exact knowledge which would enable men to foresee and predict an earthquake in any special locality; but he argues that the phenomena would be better understood if they were considered in connexion with polar displacement, and with the fact of the earth's rotation. The paper is worth careful reading.

The *National Review* contains a short and terse article signed "R. N." on the great importance, both in a commercial and a strategic sense, of carrying out without

delay the often-discussed project of "A Forth and Clyde Ship Canal." The strategic question is beyond our province; but we may say that among the routes considered in the article we should consider that a sea-level route, as against one with locks, would be so incomparably the most valuable that its superiority ought to outweigh any question of economy of construction.

The *Century* contains an article on "The New Colour Photography" on the system of M. Lumière, with reproductions of colour-photographs by MM. Stieglitz, Steichen, and others. The technical description of the process is given, but is too long to quote. The examples given are interesting, and are powerful in effect, but the rejoicings over it seem a little exaggerated.

Harper contains a short article by Mr. W. H. Pickering, of the Harvard Observatory, on "Different Explanations of the Canals of Mars," which sums up dead against Professor Lowell; he does not deny the existence of the straight lines, though he absolutely refuses to believe (and so do we) in the statement that some of them have been doubled by parallel "canals" since the time when telescopic observation was directed to them. But as to the irrigation idea, he points out that with the thin atmosphere of Mars evaporation of water must proceed with great rapidity, and proceeds:—

> "It would seem necessary to substitute gigantic water-mains for the canals, with a most extended system of supplementary piping. The amount of power required to pump sufficient water to irrigate anywhere between 100,000 and 1,000,000 square miles of surface, through such a system of piping, may be left to any competent hydraulic engineer to compute, with the added statement that most of the water is to be transported to a distance exceeding 1,000 miles."

Scribner, under "The Field of Art," contains an account of the portraits by Sully at the U.S. Military Academy at West Point, with some illustrations. Sully, who was no mean portrait-painter, was to the States what Reynolds or Romney were to England at a little earlier period. His memory seems to be worth reviving.

The *Pall Mall Magazine* contains an article on the art-work of Mr. Cadogan Cowper, with illustrations of more works of his exhibited at the Royal Academy than most of us perhaps remember. Also one on "The Airship as a Destroyer," with illustrations of some of the most notable modern war-balloons, in most cases taken in the air from another balloon.

To the *Antiquary* the Rev. Herbert Pentin, Vicar of Milton Abbey, contributes an article on the carved bosses in the vault of the church, and their signification; features which, as he says, owing to their position, are too much overlooked in this and other ancient churches. A number of small illustrations are given, and some elucidation of the subjects is offered. "The Büren of the Black Forest," by Mr. E. C. Vansittart, is a very interesting article on the traditions and habits of peasant life in a region which has been little disturbed by modern ideas and modes of life.

THE ARCHITECTURAL ASSOCIATION:

THE KINGSTON EARTHQUAKE AND BUILDING IN JAMAICA.

An ordinary general meeting of the Architectural Association was held on Friday last week at No. 18, Tufton-street, Westminster, S.W., Mr. Walter Cave, President, in the chair. Mr. Maurice Webb, hon. secretary, read the minutes of the last meeting, and these having been confirmed and some nominations read,

Mr. C. Wontner Smith, hon. secretary, announced that the second spring visit would be held to the United Kingdom Provident Institution, Strand, at 2 p.m., on Saturday, January 25. As the party will be limited to fifty, early application should be made to the secretary for a ticket of admission. He also announced that the Camera Club dinner would be held on January 23 at the Café Monico. He also announced that an Architectural Association Students' dance would be held on January 17 at the Princes Galleries; tickets to be obtained from Messrs. Silk and Webster.

Messrs. W. G. Mooney, of Penge, and S. H. Rainforth, of Lincoln, having been elected as members,

Sir Charles A. Nicholson, Bart., read the following paper on "The Kingston Earthquake and Building in Jamaica":—

"Last May I was asked by the newly-appointed governor of Jamaica to go out to that colony with him in order to discuss certain matters concerning the reinstatement of the buildings destroyed by the recent earthquake. I propose to-night to describe a few of the buildings in the town of Kingston where the earthquake was most severely felt, with special reference to their behaviour under earthquake shock, and then to indicate briefly the lines upon which reconstruction seems to me to be desirable in a climate such as that of Jamaica, and in a locality subject to frequent hurricanes and occasional earthquakes.

The colony has been fortunate at the present juncture in obtaining a new governor who, in addition to his other qualifications for the office, possesses an extensive practical knowledge of building, and, in my humble judgment, an exceptionally sound architectural instinct. This personal reference may be forgiven as directly concerning our present subject, for it indicates that the conditions are favourable for a reconstruction upon sensible lines, always provided that the caprices of private building-owners can be restrained within reasonable limits.

Considering the interesting nature of the subject there has been very little written about construction in earthquake countries. The best-known authority on the matter is, I suppose, Professor Milne, whose unique knowledge has been acquired in Japan. The effects of the Jamaica earthquake have been studied on the spot by Dr. Vaughan Cornish, in whose company I had the privilege of travelling to Jamaica in May.

Approaching the town of Kingston from the sea the effects of the disaster were less evident than one might have expected, because, as we shall presently see, a good many of the roofs of the buildings remained in place, although the walls were wrecked. But in the central part of the town the earthquake was followed by a fire which burnt everything within an area of some 30 acres, and naturally the destruction of property caused by the fire was more complete than that caused by the earthquake, although the loss of life was mainly attributable to the latter cause. This is neither the place nor the time to enlarge upon the details of the disaster, beyond paying a brief tribute to the courage with which the late governor and the British officials in the colony dealt with the difficult problems which they were so suddenly called upon to face. In an incredibly short space of time after the earthquake the streets had been, as far as possible, cleared of debris, the most dangerous of the ruins had been pulled down, the electric trams were running, and temporary shops and offices had been put up in all parts of the town. At the time of our arrival in the island several of the partly-wrecked buildings had been reinstated, and others were in process of being entirely rebuilt. Fortunately, however, nothing permanent had been done in the burnt-out area, so that it will be possible to treat the reconstruction of this part of the town upon a more or less consistent plan.

Aspect of Kingston.

Kingston stands on gently-rising ground, backed by a chain of high hills some six miles from the sea. At the end of the low promontory which encloses the almost land-locked harbour is the military station of Port Royal, the site of a town which was destroyed by an earthquake two hundred years ago. The survivors of this disaster built the present town of Kingston upon the mainland. Kingston faces south, and is laid out in gridiron fashion—the principal thoroughfare, King-street, rising with a gentle slope from the harbour at its south end to a square called the Parade-ground on the north side of the town. The public buildings were scattered about in different parts of the town, and it was at one time proposed to rebuild the whole of the Government offices in a single block of buildings, the site for which was to have been taken in the Parade-ground. As this scheme meant some curtailment of a valuable open space, and as the limitations of the site would have necessitated a building of several floors, and furthermore as the site would have been some distance from the principal streets, the Government have taken the present opportunity of acquiring land in the burnt-out area at the point where King-street intersects the approaches to the railway station at the west end of Kingston. Here will be formed a square, round which will be grouped the post-office and other Government buildings to which the public require frequent access, and it is hoped that it will further be possible for the Government to control the design of the remaining frontages in King-street and the other streets round the public buildings, so that this part of the town may be rebuilt with shady porticoes and other delights.

Conditions of Construction.

Turning next to constructive questions—there are three things which determine the conditions of building in such a place as Kingston. In the first place one has to contend with the great heat, for, excepting in the hills, it is never cool in the daytime in any part of Jamaica. Next one has to guard against hurricanes, which occur every few years; and in the third place one has to remember the possibility of earthquakes, which happen but seldom, and for that reason are perhaps the greater source of danger when they do take place.

In the towns it is, of course, also necessary that buildings should be fire-resisting.

The materials available locally are bricks and coarse limestone resembling coral rock. The Jamaica hardwoods, of which bullet-tree is the favourite, are practically everlasting, but difficult to obtain in large scantlings, because there are no forests of suitable trees large enough to make it practicable to prepare the lumber and bring it to market in an economical fashion. So the timber generally used is pitch-pine lumber imported from America. This, when free from sap, stands fairly well in dry and well-ventilated positions. Roofs, except in the actual town of Kingston, are mostly covered with shingles, these being generally of hardwood. In the towns iron has been largely used, either in corrugated sheets or in the form of large pantiles about 3 ft. by 2 ft., the effect of which is not bad. The ugliest roof covering used, and consequently the most popular at the present time, consists of "Eternit" slates, which are generally laid diamond fashion, and coloured a lurid red. The test of time has yet to be applied to this material. The climate simplifies greatly what one may call the minor difficulties of planning. Fireplaces are nowhere required except in kitchens; hot-water systems are unnecessary, draughts are to be courted rather than avoided, and even window glass is only needed as a protection against storms and dust.

The older buildings in the colony, if not of wooden construction, are mostly of brickwork, sometimes with dressings of imported stone or of stucco; their style is Georgian, and the best of them contain beautiful mahogany joinery and staircases. Beyond the fact, however, that rooms were lofty and walls were thick and most of the houses were provided with wooden verandahs, no special effort seems to have been made to deal with the problem of the climate in the older Kingston buildings. The more recent buildings are worse in this respect than the older

ones. Too often they are of flimsy construction, besides which they almost all lack the simplicity and restraint which are proper to buildings that are necessarily inexpensive.

Effect on the Churches.

As might naturally be expected the churches of Kingston suffered from the earthquake more severely than the civil buildings, the latter being more or less buttressed by their partitions and their verandahs. The exact nature of the earth movements has not been definitely pronounced upon so far as I am aware, but the effect upon buildings in Kingston resembled that of a battering ram working east and west. Thus the side walls of the churches were merely cracked, while their end walls were almost invariably overthrown bodily. The west tower of Kingston parish church, which stood on four arches, split and had to be taken down after the earthquake. At Spanish town, twelve miles off, the cathedral has a tower whose walls are built up solid from the ground. This tower was slightly cracked, but the earthquake shock was much less severe in this locality than at Kingston, where every one of the churches was wrecked. Kingston parish church was originally a plain cruciform building, with heavy bond timbers built into the brick walls. It was enlarged about thirty years ago by the addition of double aisles to the chancel and single ones to the nave. These works of course necessitated the destruction of the bond timbers, and, although the building was not more than 20 ft. high to the wall-plate, the side walls have been shattered in every part, and the end walls have collapsed towards the east. The columns of the aisles were cast in plain concrete, and, with one exception, were all sheared off about a foot above the pavement. The arches were also of concrete, and slices fell out of some of those near the crossing, where the abutments were least effective. The parish church was rather a fine Spanish-looking building, and it contained several interesting monuments and a fine mahogany baldaccino.* Another church, St. George's, was of ordinary galleried Hanoverian type. To this an apsidal chancel had been added, which fell down bodily. The nave, however, was saved by its galleries, which acted as internal buttresses. The Roman Catholic cathedral and another church fell down like card houses. Two synagogues and several large meeting-houses were seriously, and in most cases irreparably, damaged.

Secular Buildings.

Certain secular buildings in Kingston were more fortunate than the churches. Thus the headquarters house, as the Colonial Secretary's office is called, a handsome Georgian two-storied house, built upon cellars, and having verandahs on its east and west sides, is now in use again after some repair. The King's house, about four miles out of the town, of somewhat similar construction, was so badly shaken as to require rebuilding, but none of its main walls actually fell down. On the other hand, two buildings of the same date and character, Jasper Hall and the Jamaica Club House, were entirely wrecked.

The first of these was a very fine house, with thick brick walls and partitions and excellent joiners' work. The club house was also thoroughly substantial. Both these buildings are in the eastern part of the town, where the shock was most severely felt. It is worthy of notice that in those cases where the oscillation has been sufficient to dislodge the roofs the collapse of the buildings has been complete, but in other instances, where the roofs happen to have held in place, they have acted as ties and prevented the total destruction of the walls, consequently there was less loss of life in the latter cases. The number of roofs in Kingston which stood the earthquake in spite of the partial collapse of the walls is remarkable, and this may be attributed to the fact that most of the roofs were of light scantlings and covered with wood shingles. In some cases one or two of the outer walls collapsed above the first-floor level, leaving the roofs supported on the remaining walls and the studwork partitions. Other roofs have bodily listed over or have shifted on the wall-heads, but have held together enough to prevent the most serious results. The advantages of a light and tenacious form of roofing are, therefore, very great, and the use of wall-posts carrying a roof from the ground level is also to be recommended.

Effect of Earthquake on Different Methods of Construction.

Professor Milne, from his experience in Japan, condemns the use of arches, and recommends a trabeated construction. But the effects of the Kingston earthquake go to show us that all openings are a source of danger, whether there are lintels or arches they act as battering rams and cause diagonal cracks in the piers between the openings. This occurs in walls running parallel to the line of shock. In walls placed transversely the whole upper portion is frequently snapped off just above the level of a range of window sills, and here I may again remind you that in Kingston the apparent line of shock was east and west.

Semicircular arches behaved fairly well in cases where there were good abutments, and where the supporting piers did not fall down. Of properly-built pointed arches without keystones and with concentric rings I saw none in the island. Probably such arches would have stood well. The semicircular arches in Kingston are generally bonded and not built in independent rings, several of these have cracked at the haunches, but not very many of them have failed completely. In certain cases the arches were faced with gauged brickwork, which has fallen out, but real arches have not stood badly. On several of the old sugar estates there are arched aqueducts with good abutments and no great top weight, and few of these showed the slightest damage after the earthquake. Neither were any of the underground structures affected, I refer to such structures as tanks, culverts, and bridges. And, further, there are several buildings in Kingston which were practically undamaged, of such was a large three-storied warehouse of ordinary substantial construction, with posts supporting the floors and with a slight queenpost roof. This is being temporarily used as a Government office, and the only damage visible is a slight movement of the roof and a few unimportant cracks under the tie-beams. Another case is that of the tramway company's power house, a large, plain, ugly room, without internal supports, some 25 ft. high to the wall-plate. It is built of brickwork in cement mortar, and only shows a few cracks in the eastern gable. A large shed on the quay, built of cement concrete without reinforcement, with a timber trussed roof, is also quite intact.

Timber frame buildings naturally suffer very little damage. Thus at Port Royal, where the shock was very intense and the ground subsided bodily, some of the wooden buildings took a list of several degrees without much harm being done. And, in some buildings in the town of Kingston whose floors and roofs were carried on posts and beams framed together shipwright fashion, with knees and braces, the outer brick walls were shaken down, but the floors and roofs stood and are again being used after having been temporarily closed in. Such is the case with the old court house and treasury, now serving as a temporary post-office.

Conclusions to be Deduced.

From these data one may deduce certain broad rules which one may bear in mind if one is building in a place liable to earthquakes. And first as to materials. Timber framing is reliable and is perhaps the best method of construction in rural districts, but is, of course, open to objection in towns, owing to the risk of fires; moreover it is doubtful whether one can place very much confidence in the durability of the pitch-pine, which is so much used nowadays in Jamaica, though the local hardwoods, of which the supply is very limited, are durable and excellent in every respect. Brickwork in lime mortar has proved a failure in Jamaica; the lime being very poor and the sand unsuitable for mortar-making the resulting product is little better than dust. Brickwork in cement and cement concrete have stood well, and the local sand appears to make good cement mortar, though, as has been already said, it makes bad lime mortar. Steel frame buildings are well enough if their skins are well fastened to their skeletons, but there are practically no steel frame buildings in Jamaica, and one must form one's opinion as to their merits from their behaviour in other places. But perhaps the best solution of the problem is to build in armoured cement concrete or reinforced brickwork, since for most purposes the cost of a frame building is prohibitive. A large house built of concrete made of sea shingle and mixed with salt water, reinforced with Ransome's twisted bars, has been built at Port Antonio in the north of the island. This was quite intact after the earthquake, though the neighbouring court house was seriously damaged. The shock here was certainly less severe than at Kingston, still the test was a severe one, as several fixed baths in the house referred to were half-full of water at the time of the earthquake, and the shock was enough to cause this water to swamp the floors of the bathrooms. No damage was, however, done to the house, the walls, floors, and roofs of which are all of armoured concrete. Perhaps this may be set down to the fibrous and partially elastic nature of the material, and, so far as one can judge without visiting San Francisco, the evidence to be obtained from the disaster in that place is all in favour of properly-constructed armoured concrete construction in a district subject to earthquakes.

Precautions Necessary.

In addressing an audience of practical men it is hardly necessary to refer to the precautions that one must needs take in order to secure competent supervision in the execution of reinforced concrete work, but, granted this careful construction, I am not aware that there is any valid objection to this material beyond the fact that sufficient time has not elapsed since its introduction to enable one to speak confidently of its durability.

Some new buildings and partial reconstruction of old ones have, since the earthquake, been carried out in brickwork in cement, plentifully strengthened with hoop iron bond and with lacing courses of reinforced concrete, and it is probable that such work will resist any ordinary shocks. Still, certain precautions seem to be desirable in the construction of brick buildings, even when built in cement. We have already noticed that windows and doors are a source of weakness, because the sills and lintels batter the brickwork if the building is shaken, and cause diagonal cracks from the lintel of one opening to the sill of the next. The general use of solid hardwood frames instead of slight sash boxings would lessen this danger. And in the case of the carpentry construction it would be an advantage to put long wall-posts under the ends of all roof trusses, and to secure the floor binders to these with iron shoes or with bolts and cleats, and the carpentry should be well braced, the use of morticed framings being avoided lest the tenons should break off under shock. The piers of arcades and colonnades should be strengthened with vertical reinforcement to prevent shearing off at the ground level caused by the inertia of the superstructure when the foundations of a building are suddenly shaken. The failure of arches would be less likely if they were built in concentric rings to allow of a slight elasticity, and if the skewbacks were

corbelled out in horizontal courses over isolated piers.

Chimneys are scarcely ever used in Jamaica except in outdoor detached kitchens. The Japanese practice is to keep the roof timbers clear of the brickwork of their chimneys, so as to allow these to vibrate freely at times of earthquake, and prevent their being snapped off at the roof level.

Lastly, it is very important that the foundations should be adequate. A great deal of the damage done in Kingston seems due to the fact that, in the course of time, the streets, which have only been paved in comparatively recent years, had been worn down to a level below that of the foundations of the buildings, which were thus deprived of lateral support beyond that afforded by the slight boundary walls of their forecourts. The Japanese have experimented in the use of "free foundations" for some of their buildings. In certain instances ball bearings have been used, in others sand joints between the foundation and superstructure, but these devices have not proved a great success, and are, moreover, better adapted for framed buildings than for those of masonry. But the fact that underground constructions escaped damage at Kingston seems to indicate that a building with a sunk basement standing on a concrete raft with open areas all round it would probably have been very little affected by such an earthquake shock as was there experienced. The plan thus indicated cannot well be adopted in Kingston, owing to the fact that sunk basements are practically useless in so warm and damp a climate, and, furthermore, because there are no rain-water drains in the town, and therefore such basements would be frequently flooded.

Hurricanes.

Now, besides the risk of earthquakes, which after all only occur once in several generations, the builder in Jamaica has to take certain precautions against the violent hurricanes which may be expected every few years. It is, therefore, necessary that roofs should be securely fastened down to their substructures. Verandahs, too, which are in very common use, must be protected against the lifting force of the wind, and the use of iron roofing sheets is a source of considerable danger, as may well be realised if one imagines a score of these products of modern enterprise hurtling pell-mell around one's back garden.

Shingles make far the safest roof in country places, while, in the towns, the ideal form of roof is a flat one covered with asphalt and a good thick layer of earth, or in some cases paved.

There is a local prejudice against asphalt roofs, probably due to the fact that in Jamaica this material has generally been laid on boarding without proper precautions against cracking caused by the shrinkage of timbers, and, further, without any external protection against the extreme heat. But an asphalt concrete flat with a good external covering of non-conducting material would, if properly constructed, form one of the coolest and most durable of coverings, and one, therefore, well suited to West Indian conditions.

English Colonial Architecture.

It must be confessed that English colonists have so far not succeeded in evolving a satisfactory and rational architecture for tropical climates. A very natural desire to recall the aspect of home buildings has caused the perpetration of such absurdities as Calcutta Cathedral in Strawberry Hill Gothic, and the Parliament houses at Capetown and Melbourne in corrupt Hanoverian Classic.

The cubical planning and flimsy materials of most private houses in our English colonies are also quite unsuited to the tropics, and our colonial churches are generally planned with even less intelligence than the secular buildings, which latter generally possess verandahs as a concession to climatic conditions. Jamaica buildings are neither better nor worse than those of other colonies in these respects, which is disappointing in an island which was a Spanish colony until the XVIIth century. In Mexico, Cuba, the South American states, the Philippines, the Canaries, wherever the Spanish influence can be traced, we find satisfactory tropical buildings with courts and arcades, large cool rooms, thick low walls, and flat or low-pitched roofs of good substance. In Cuba the windows are unglazed openings, with iron grilles only, a feature which might often be adopted in Jamaica if some movable protection were adopted against wind and dust storms. In order to supplement the few illustrations of existing tropical buildings which are exhibited in this room I have ventured to show you some preliminary designs for the reconstruction of buildings in Kingston in which a humble attempt is made to deal with the conditions of a hot climate as well as the possibility of a future earthquake.

In conclusion, it would be ungracious not to mention some English colonial buildings where such considerations have not been overlooked. Such are the Brisbane and the Rockhampton post-offices, low buildings with pillared verandahs and open courtyards. Such too are, I believe, many of the planters' houses in Ceylon and some of the merchants' houses in Calcutta and the Anglo-Indian bungalows. A church recently built in Upper Egypt seems to be perfect in respect of its adaptation to the climate and locality; and lastly I would pay a tribute to the memory of the authors of two designs for the cathedrals of Colombo and Brisbane, the works respectively of Carpenter and Burges, both of which have been published in a little book of Beresford Hope's. In these designs the problems of climate and locality were handled in a masterly way. Unfortunately neither scheme was carried out. Colombo Cathedral was actually built from a different design and under amateur guidance, while the new cathedral at Brisbane which is, I believe, now in progress, although on a larger scale than Burges designed, is being built in correct Lincolnshire Early English without any particular observance of local conditions.

Works to be Studied.

For present-day work we shall do well to study the old Spanish buildings and the excellent work of contemporary American architects in Florida, California, and elsewhere. In conclusion, it may be said that the conditions now obtaining in Jamaica are not unfavourable to good work, and if what is now being done turns out to be a discredit to the colony the unfortunate result can only be attributed to our natural perversity and original sin. The authorities in the island are honestly anxious to get the rebuilding done in an intelligent fashion, and only the builders and architects remain to be reckoned with. How far they may succeed in nullifying the good intentions of the Government the next few years will show us."

Mr. S. Hurst Seager, of Christchurch, New Zealand, who was called upon by the chairman, proposed a vote of thanks to the lecturer. He said he practised in a country which is subject to earthquakes, although not of the extreme kind like the Jamaica ones. But sometimes they had earthquakes which did considerable damage. He had experienced the effects of one or two earthquakes, during one of which, in the seventies, he was standing in a long corridor with an open doorway at one end. The corridor was about 70 ft. long, and it seemed to him to be working up and down alarmingly, so that the doorway was first up above him and then down below. It seemed ages before he could get out, but when he did people outside said that all the trees and hedges appeared to be waving up and down like the waves of the sea. All that showed that they must not rely too much at such times on their impressions, for after he had studied the question scientifically he was surprised to find that the greatest amplitude of a wave caused by an earthquake, in New Zealand at all events, was only 1 in., and that was in connexion with an earthquake which did considerable damage. It was therefore all a mistake about the corridor rising and falling and the trees and hedges waving up and down, but it was curious to note how such impressions were created; they were due to the fact that the observer was oscillating to a slight extent. Professor Milne gave 3 in. as the greatest amplitude of an earthquake wave. On another occasion, at Christchurch, at the time when the cathedral spire was of stone, the top for about 5 ft. down was shifted about 2¼ in., the stone being moved that distance. The top was taken off to the extent of some 20 ft. or 30 ft., and on the advice of a Japanese architect a wooden top covered with copper was put up. There was great difficulty in evolving satisfactory theories from isolated instances; the ascertained facts were so contrary that it was impossible from one incident or even from a whole number to derive any theory which could be wholly upheld. He thought Sir Charles Nicholson was a little bold in drawing conclusions from what had taken place in this particular earthquake, for forces were not by any means constant. As Professor Milne had pointed out, if the earth were wholly homogeneous—of one material throughout—one might expect to have constant forces acting, and we could tell then more or less accurately what took place at any one point. But the earth's crust is not homogeneous; it is composed of different materials, with different powers of resistance and different powers of elasticity; and there are also cracks and fissures in it which made it difficult to say what would happen at any one place. And Professor Milne pointed out that there are some portions of districts subject to earthquakes which he called islands of repose, that was to say that in the midst of shaking and destruction there would be buildings which would not be affected at all, not because they were better than the rest, but because the ground was not affected. It was therefore impossible to say, even when two buildings were fairly close together in an earthquake district, that the construction of one was right and the construction of the other was not; for what happened in an earthquake in such a case we had no data to go upon, and it was impossible to draw any scientific conclusions. He was not in agreement with the lecturer in one or two of his conclusions; for the following reasons. We speak of earthquakes and earthquake waves in a rather vague way; we were not quite sure what they were and how they acted. The earthquake waves must be altogether dissociated from waves of the sea which, as we realised at once, were simply surface waves. Down below the water was at perfect rest; the waves were formed by the wind rushing across the surface and creating motion, and the lower down one got the more repose there was. It was perfectly true that similar waves were found on the surface of the ground in an earthquake, but there were others which were much more important, i.e., vibrations which reach the surface in direct rays from the centre of eruption, varying according to the elasticity of the material through which the force arrives, so that in the case of earthquakes we had to imagine the terrific force exerted. It might be equal, so it was calculated, to 684 atmospheres, and it would be exerted down in the depths of the earth from perhaps ten to fifteen miles; and this force would send direct vibrations by means of the alternate compression and expansion of the strata. This force would be sent in all directions, and would thus reach the surface either vertically or at any oblique angle, dying away horizontally until perfect rest was obtained. Certain undulations of the surface

were caused by this direct force, and these travelled in horizontal waves, and we could never tell which of those two forces was dominant at any particular point. It might be wholly vertical, and in one of the drawings shown by the lecturer there was a vertical crack which showed that vertical forces were acting; for Professor Milne has said that vertical forces produce vertical cracks, and oblique forces meeting the building will produce diagonal cracks. The greatest danger was to be apprehended from those forces which reached a building at an angle of about 45 degrees; the vertical forces lifted the building up and down and did comparatively little damage; those which approach 45 degrees would have a horizontal and vertical effect and would create the greatest damage. The effect of these forces on buildings was to cause them to oscillate, or to swing backwards and forwards, and he submitted that it was not by reason of the height of the chimney above a building it was caused to oscillate or vibrate in different periods of vibration. If the chimney was the same height as the building it would still oscillate in different periods; a light portion of a building would vibrate more quickly than a heavy one, and the heavy one would tend to go on vibrating when the lighter one would tend to go back to rest. The battering-ram effect Sir Charles Nicholson spoke of was not quite that effect, because in the battering-ram the impulse acted in one bound, but in the case of an earthquake shock the whole building swung backwards and forwards, and because of the different vibrations set up in the different parts, owing to their different weights, they were mutually destructive, and thus the damage was done. Therefore, we had to consider what were the types of buildings which were likely to withstand the forces set up. Professor Milne spoke of two; one, the wicker-basket type, and the other the steel-box type. The one was the ordinary frame house, which stood very well in New Zealand, where nearly all the houses were built of wood: they stood earthquake shocks very well, for there was an elasticity in the material and all the joints would give, and so little damage was done. The chimney broke in many cases, for the reason already given, and they therefore left a clear space between the chimney and the building, so that the chimney could oscillate with different periods to the building without damage. The steel-box type was suggested, or nearly, when Sir Charles proposed to build with armoured-concrete. In such a form they had a perfectly strong building which could withstand all the pressures brought to bear upon it. With a vertical pressure on such a building they could imagine what would happen. There might be pressure under one part of the building which was not acting in another part, and, if so, a building would spread open at any line of weakness; and the reason why arch construction was not recommended was because arches already had a tendency to thrust a building apart, and when a building opened out the arch came to grief. Instead of the arch, if they had armoured concrete the iron ties held the building together, and there could not be any spread of the building, and that was a method which was most likely to be a perfectly safe one in an earthquake country. He had tried to follow Sir Charles in his argument that it would be a safe thing to sink a building and to build a basement with an open area round it. He knew that Professor Milne had said that in his book, and he (the speaker) did not like to criticise it, especially as the lecturer thought the same. He could not, however, see the reason for it, considering that the greater force to guard against was the direct waves from below. That we should guard against those direct waves in any degree by having a basement he could not see, though if they sunk a building and made an area all round it they would probably reduce the effect of the surface waves; but not the others. Since reading the lecturer's paper he had discovered that Professor Milne had revised his chapters on earthquakes and buildings in a periodical of the Japan Seismological Society. In this, although he stated all the other conditions which he considered essential for safe building where there were earthquake shocks, he omitted that particular one from his list, and that one only; he printed all the others just as he had in his book published five years previously. Professor Milne referred to the methods which he suggested as simple suggestions put forward in a tentative manner, as the subject was in its infancy. Professor Milne had done a great deal of work in harmonising the different views of what should be done in earthquake districts, but they had yet to determine scientifically what to do to make buildings safe when an earthquake took place. At present it appeared that a method of armoured construction was the best, but even that point had not been wholly decided. As to underground structures, he did not think it was a rightful conclusion to draw that because such structures had not suffered in this case, they would not in any circumstances. They had no top weight, but they were supported by the ground, and if a horizontal wave came along such structures would take the place of the ground, the wave would pass through them, and no harm would be done, not because they were in the ground, but because they were supported on either side by the earth. If they had a number of ivory balls in a row, say a dozen, and struck the end one, the one at the other end would run off and the intermediate balls would not be disturbed. That was exactly what happened with earthquake waves and buildings; where the waves had free play they did damage; where they passed through a body well supported then the damage, if any, was slight. Wellington, New Zealand, was more subject to earthquakes than Christchurch, which is 200 miles away, for it was nearer the centre of an old volcanic system. In the by-laws of Wellington it was required that brickwork should be bonded together with strips of concrete under and over windows and openings, and in that concrete there were strong iron ties, and this went right round the buildings as rings. That was an excellent precaution to take.

Mr. R. S. Balfour briefly seconded the vote of thanks.

Mr. H. C. Corlette said he thought that it was not only the movement, but also the weight of a column which had a great deal to do with the fracture they saw in the piers on the diagrams illustrated. There was a difference of movement in a long column, and he thought for this reason that there should be vertical reinforcements to strengthen piers. The top of a chimney when it swayed had a greater distance to get back to its vertical position than the base, and the moment the return movement took place in an earthquake shock the upper part was left behind. So much would depend on the nature of the shock. If it was a shock taking the form of a wave, reinforcement would have to be rather horizontal than vertical, as the nature of the shock dictated the nature of the reinforcement to be given to buildings. Steel construction seemed to be the most satisfactory in the case of high buildings, where the shock moved horizontally right and left. He had been interested in hearing Sir C. Nicholson's remarks about arches in concentric rings. Where these were used there was a certain amount of elasticity in the arch which was absent where the arch was bonded with long voussoirs. The latter were apparently the only type of arch found in Jamaica, and they did not stand well. It was a pity that there had been no Gothic pointed arch there at the time of the earthquake, so as to enable them to say how much the elasticity of such an arch would have been useful. As to the condition of the earth's crust, he quite believed that the result of an earthquake movement must be largely affected by the condition and nature of the strata forming the crust, and there would no doubt be more movement in one place than in another owing to these varying conditions.

Mr. Henry Tanner, jun., said he understood that Mr. Hurst Seager said he did not agree that it was any use to sink buildings, but then he thought Mr. Seager argued in favour of doing so.

Mr. Hurst Seager: The shocks which are most to be feared are those which come upwards from the centre or the focus where the explosion took place, and by sinking the building you do not get rid of the force.

Mr. Tanner said that the part sunk was admittedly safer than the part above ground in the case of horizontal waves. A sunk building would not, he should have thought, oscillate so much.

Mr. Hurst Seager: If you have ground all round the sunk part that does away with my objection, but then you sink your building, as a foundation or a cellar. I suppose that Sir Charles Nicholson was speaking of sunk buildings with an area all round?

Sir Charles Nicholson: Of solid concrete with retaining walls and an area all round. The retaining walls in one piece with the raft.

Mr. Tanner, continuing, said that, roughly speaking, there were three types of construction, he believed—timber frame, ferro-concrete, and steel-frame buildings. Had Mr. Hurst Seager had any experience of the ordinary steel-frame building—the skeleton frame? [Mr. Hurst Seager: I have not.] That might be a good type of construction to employ in earthquake countries. Would the lecturer tell them if there were any building regulations in Jamaica? [Sir Charles Nicholson: Yes.] And you are allowed to build timber structures?

Sir Charles Nicholson: Yes, except in certain places in the town, and there you have to employ fire-resisting materials. Most dwelling-houses in Kingston were detached, and have little gardens or compounds between them and the road. He referred to that matter in speaking about foundations being several feet above the level of the pavements, which would not be possible in the case of houses abutting on to the road. It was possible only in the case of detached houses. In most cases the road was worn down to a low level and paved with brick; then there was a rise of 2 ft. on to a side walk, also paved with brick, which was not worn down. If one wanted to cross the road they had to go up and down steps. At the side of the side walks were generally garden walls and brick piers and wooden railings.

Mr. Smith, a native of Jamaica, supported the vote of thanks, and referred to the old House of Assembly at Jamaica, which had withstood many shocks, and which contained a mahogany staircase up which twenty-four men could walk abreast.

The Chairman, in putting the vote of thanks, said that elasticity of material seemed to be the chief thing to aim at, and he had in his mind a force which we had in this country, which was more on a par with earthquake waves which were travelling horizontally, *i.e.*, the wind. There was no doubt that elasticity in our construction, especially in chimney-stacks of great height, like the factory chimneys of the North of England, was essential to their stability. Some of those chimneys reached a height of 250 ft., and they swayed 8 in. or 9 in; if they did not they were not safe, and the effect of the movements of air on such structures was illustrative of the effect of earthquake forces on structures. According to Mr. Hurst Seager, the most dangerous and most powerful shocks were the vertical ones, and the transference from the vertical to the horizontal waves was the puzzle, for there was no doubt that the horizontal waves did the mischief.

There seemed to be a want of agreement between the speaker and Sir Charles Nicholson as to the desirability of doing more in the way of sinking buildings. According to Sir Charles Nicholson, the foundations of certain buildings in Jamaica remained untouched, while, according to Mr. Hurst Seager, they would be the first part of a building to be affected. With the vote of thanks to the lecturer he thought they should include Mr. Hurst Seager for his interesting remarks on a subject which he had so evidently studied.

The vote of thanks was then put and carried very heartily.

Sir C. Nicholson, in reply, said they were dealing with practical construction and not scientific theory, and one point he wanted to indicate, and which Mr. Hurst Seager said was recognised in New Zealand, was that one had to provide against the different periods and rates of vibration between low and high buildings, and to provide that they were left free to vibrate independently. He entirely agreed with Mr. Hurst Seager really as to the nature of earthquake shocks, though he did not think the matter had been quite satisfactorily explained in that room, or understand why Mr. Hurst Seager should say that the shock all came from below. He (the speaker) should say that at Kingston it mostly came from the side. They might explain the nature of a shock by comparing it to the explosion of a bomb some distance underground, the waves of force dispersing in all directions, and there must be some particular spot immediately over the explosion—right in the thick of it—where nothing could save any building, but in nearly all cases the centre of an explosion appeared to be some distance out at sea. Even when it was on land nearly all buildings would be on one side or the other of it, and it all depended on the angle at which the waves from the focus struck the surface of the ground whether the buildings would be seriously affected or not, and the nature of the shock upon any particular building, as well as the extent of the shock, must depend on its position as regards this focus. As a matter of fact, at Kingston, Dr. Vaughan Cornish, who was investigating the subject for the Royal Geographical Society, examined buildings in every district of Jamaica except in the extreme west, which was not affected by the earthquake. Dr. Cornish made out that there were two foci to the earthquake shock—one was a little out to sea, to the south-east of the town of Kingston, and the other was somewhere at sea to the north of the Island. Dr. Cornish prepared a map showing the earthquake zones. There was one zone in which all the buildings were seriously affected or destroyed altogether, and there was the second zone in which occasional walls but no buildings fell, and there was a third zone where buildings were shaken, but no walls fell, and so on. Preparing his map on this principle, Dr. Cornish made out that there was a division between the first and most serious zone and the second zone, where the effects had not been quite so serious, passing right through the town of Kingston. All the buildings on the south-east side of a line passing through Kingston were more seriously damaged than the buildings on the other side. The church, which was comparatively little damaged, was in the area of secondary intensity; Jasper Hall and the Jamaica Club were on the south-east side, in the zone of greatest intensity; they were very much damaged, although their construction was solid in both cases, the thickness of some walls being not less than 3 ft. The nature of the shock upon a building depended upon the position of the building. An illustration which might be of interest was that of a stone thrown into a pond. The effect was a series of concentric waves passing in circles one outside the other. The earthquake shock took place in the same manner, though the impact came from below. As to the diagrams he had prepared, they showed horizontal cracks immediately above the ground, and he did not suppose that Mr. Hurst Seager had seen much of such cracks in New Zealand buildings, because so many of them were built of timber. In the Jamaica brick buildings, where there was no special reinforcement, the footings moved with the ground at the first shock—he was referring to walls parallel to the direction of the shocks—but the inertia of a heavy building above tended to keep the superstructure in its original position; the reflex shock, not being so great as the original one, tended to bring the building back with the footings, but not to close up the cracks. He had no particular reason for saying that a sunk building would be necessarily safer than another except from what he saw in Jamaica, *i.e.*, that underground buildings had stood perfectly well. In the King's House, which was seriously affected, and had to be reconstructed, was a large concrete swimming-bath full of water, and it was very little affected by the shock; and he had thought that if they could build something like a swimming-bath and put their building in that, that it would stand a good chance of being safer than another building unless it stood right over an earthquake explosion or very near it. They had to deal with the possibilities of vertical shocks and also of horizontal and diagonal shocks, but although it might not be possible in constructing buildings in earthquake countries to make them absolutely proof against any shock which might occur at a point tangentially underneath that building, yet we must remember that in a country subject to earthquake shock, for every building in the area of greatest danger there were hundreds all round which were not so situated, and they must trust that one's own building would not be that most affected. As to the tanks, was it not a fact that Professor Milne made experiments in different localities at Tokio with seismographs at the bottom of pits 12 ft. deep? In those pits he obtained apparently smaller records of oscillation than he did on the surface. Mr. Hurst Seager gave an illustration of billiard balls, but the intermediate balls were, like the tank, an island of quiescence in an earthquake area. If the building was placed upon eight balls which did not move, it stood a much better chance of keeping its position than if it stood on the ninth ball which moved away. As to frame buildings, the great difficulty at San Francisco was that the stone skin shook off from the steel skeleton. He thought the solution of the difficulty was to use reinforced concrete for the filling of steel frames. It did not appear necessary to use steel construction where there was plenty of room, for there was no need to erect buildings of more than two or three stories. As to roofs, he had seen several cases in Kingston of the roofs standing in the partitions of the houses with no other support. [Mr. Tanner: A new use for roofs: to keep the walls up.] As to wind pressure and elasticity in buildings, the Japanese were not first-rate carpenters from the point of view of construction. They were never shipbuilders until forty or fifty years ago, and not being shipbuilders they were not good carpenters, for all carpentry construction had its origin in shipbuilding. A ship had to contend with enormous strains and a ship carpenter had to be a first-rate constructor, which the Japanese were not, and the buildings in their country, he believed, rocked too and fro, and were not braced diagonally. Some writers said that that was a good thing in earthquake countries; the building rocked and came back again, but he did not see what there was to bring it back. He should certainly feel safer in a building that was properly braced than in one that was not. There was a give and take in timber, as the President remarked; each part of a timber structure gave a trifle when there was movement. As to high chimneys, a familiar case of vibration was afforded in a belfry, when the bells were ringing, particularly in some of the loftier buildings—the belfry at Rheims Cathedral, for instance, where the vibration was considerable. His allusion to a battering-ram was intended to convey an idea merely of the nature of the cracks and other damage done by the earthquake, not to explain the precise nature of the shock itself. Except in the area of greatest intensity of shock, the destruction of buildings seemed mainly attributable to the sudden movement of the foundations, which sliced the latter off from the superstructure, thus tending to cause the superstructure to fall towards the focus of the earthquake, and producing, in the case of detached pillars, conspicuous horizontal cracks just above the foundations. The extent of this dislodgment did not usually exceed 1½ in., except where the conditions were complicated by the thrust of arches and so forth. In other cases there were evidences of a swaying movement having occurred, and top-heavy structures have "taken charge" and toppled over bodily or have snapped off at weak places, as, for instance, just above the window-sills. In walls parallel to the shock line the diagonal cracks noticed across the piers, forming in most cases a well-defined St. Andrew's cross, are to be explained by the impact of rigid sills and lintels which causes the brickwork to crack along the lines of least resistance when a building is rocked or shaken. The rake or direction of these cracks is not necessarily an indication that the building has been struck a diagonal blow from underneath; their cause is rather to be sought for in the building itself. It was observed that at places in the north of the island the walls mostly fell towards the south, while at Kingston they fell towards the east. Bearings taken in various towns and villages in the directions in which walls mostly fell converge approximately in a point off the coast to the east of Kingston, and this would thus appear to have been the main centre of disturbance. There is, however, some evidence of a minor shock, having a different focus, having occurred either at the time of or else shortly after the principal shock. It was hardly necessary to observe that after any great earthquake there occur a number of earth tremors which, although not generally of a serious character, are sometimes sufficient to complete the destruction of buildings that have previously suffered a severe shaking.

The Chairman announced that the next meeting will be held on January 24, when Mr. Dudley Forsyth would lecture on "Stained Glass."

The meeting then terminated.

Illustrations.

COMPETITION DESIGN FOR LONDON COUNTY HALL.

AS we have before said, we did not think it suitable to publish any of the designs submitted in the first competition for the London County Hall until the designs in the second competition were finally sent in. Several of the designs were offered to us, some of them of great merit, which we have since seen published elsewhere, but which we declined for the reason given, and we believe the County Council authorities were of the same opinion as ourselves.

Messrs. Lanchester & Rickards entirely concurred in our view, and we therefore arranged with them to publish their design, which we think a very fine one, as soon as practicable after the second competition designs had been sent in.

The following is the description by the architects of their intention in working out the design:—

"The dominant factor in the plan was the alignment of the building, about two axes having their intersection marked by the central halls placed one above the other and carried up as a central tower. The members' entrance

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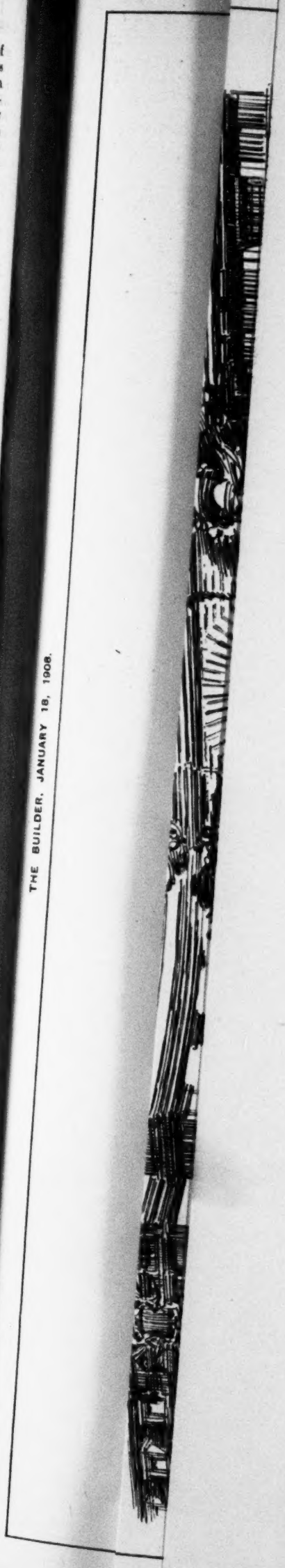
THE BUILDER, JANUARY 18, 1908.



TTER LANE, E.C.

DESIGN FOR LONDON COUNTY HALL: SUBMITTED IN THE FIRST COMPETITION.—By Messrs. Lanchester & Rickards.

PERSPECTIVE VIEW: FROM A DRAWING BY Mr. RICKARDS.

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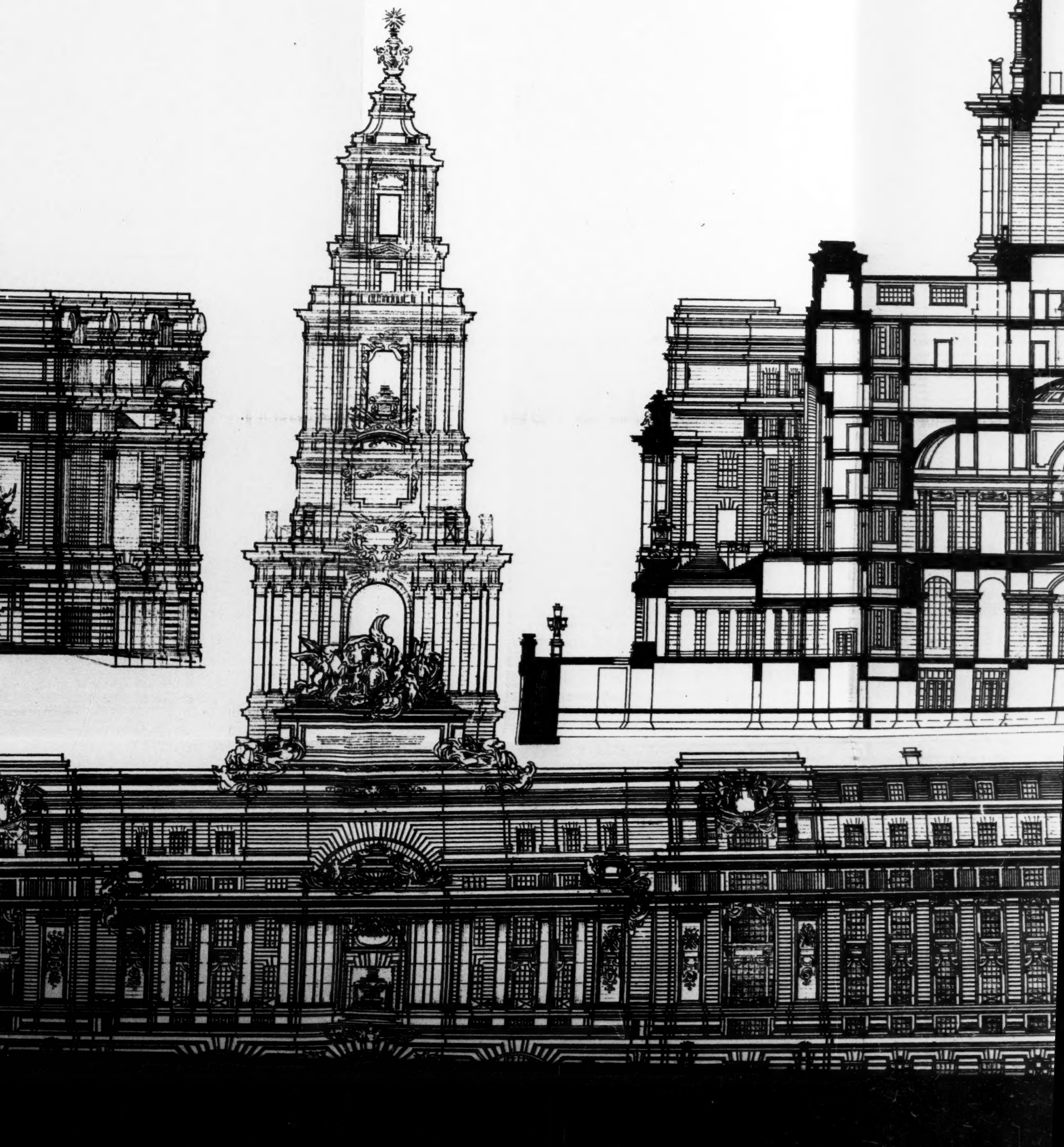
MEZZANINE



FIFTH

FOURTH

THIRD

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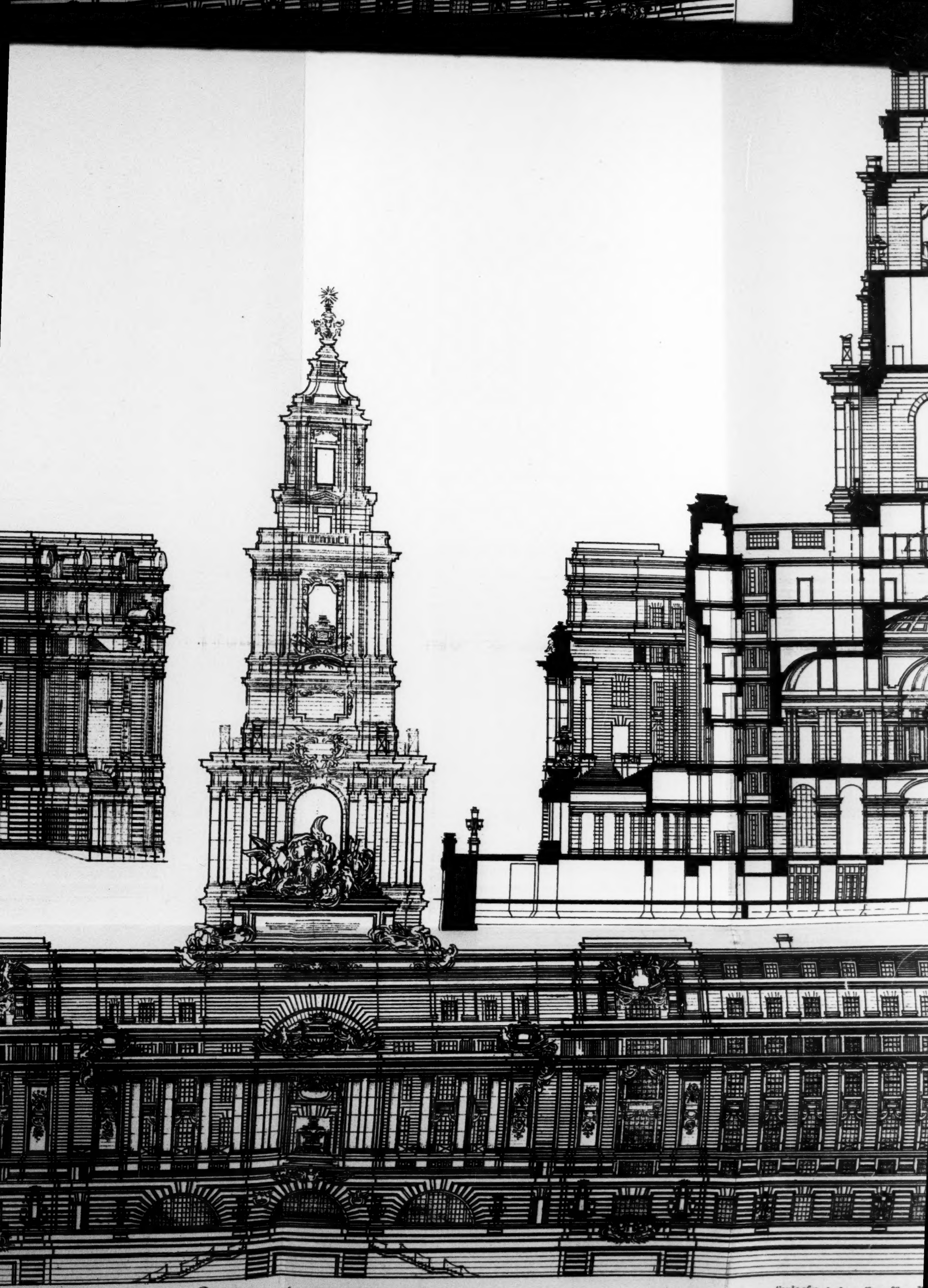
MEZZANINE

TERRACE

WATER LINE

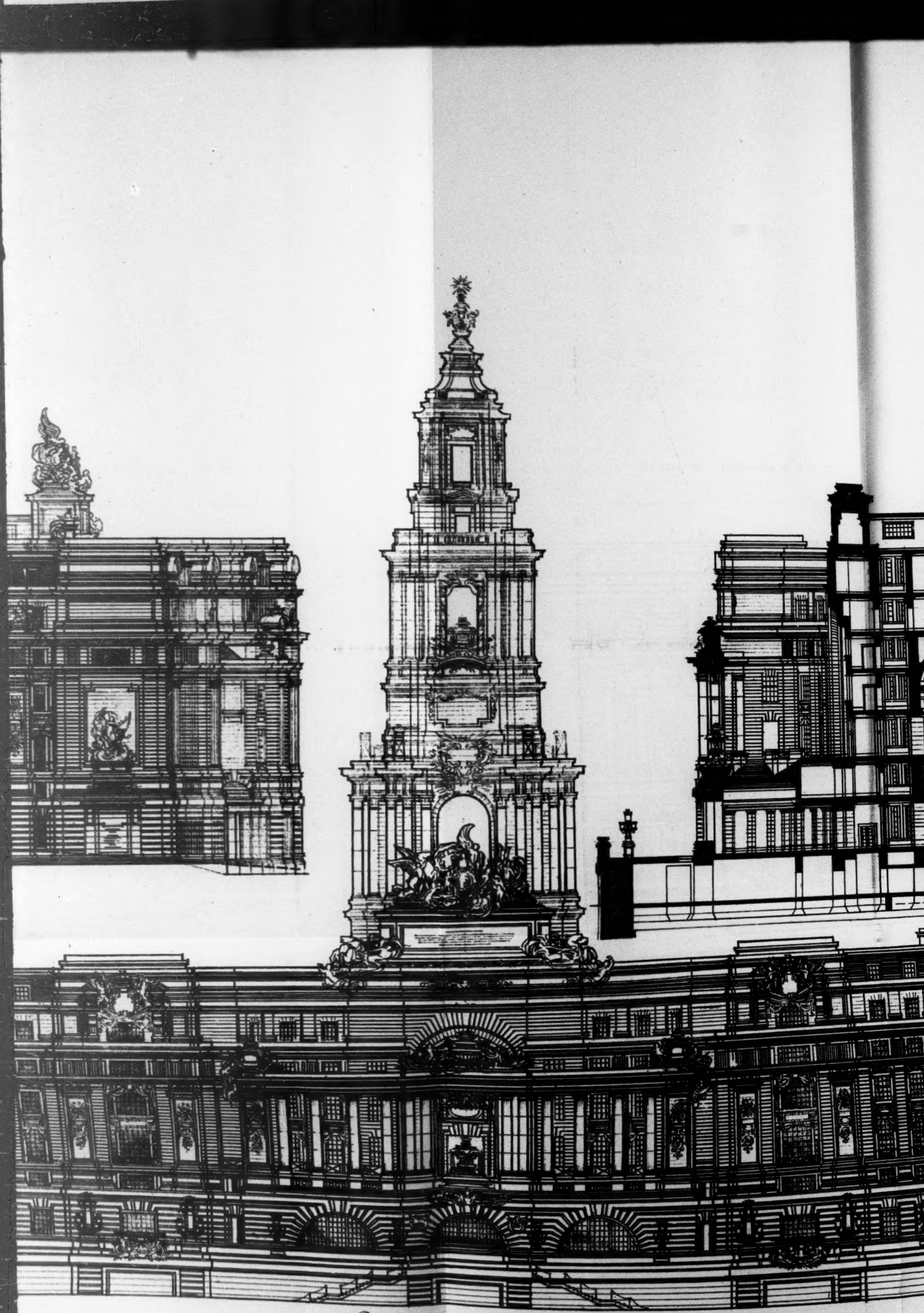
DESIGN FOR LONDON COUNTY



West Elevation: (to the river)

Scale of 10 5 0 10 20 30

NDON COUNTY HALL: SUBMITTED IN THE FIRST COMPETITION.—By Messrs. Lanchester & Rickards.
ELEVATIONS AND SECTION.



West Elevation: (to the river)

DESIGN FOR LONDON COUNTY HALL: SUBMITTED IN THE FIRST COMPETITION.—By Messrs. Lanchester & Rickards.

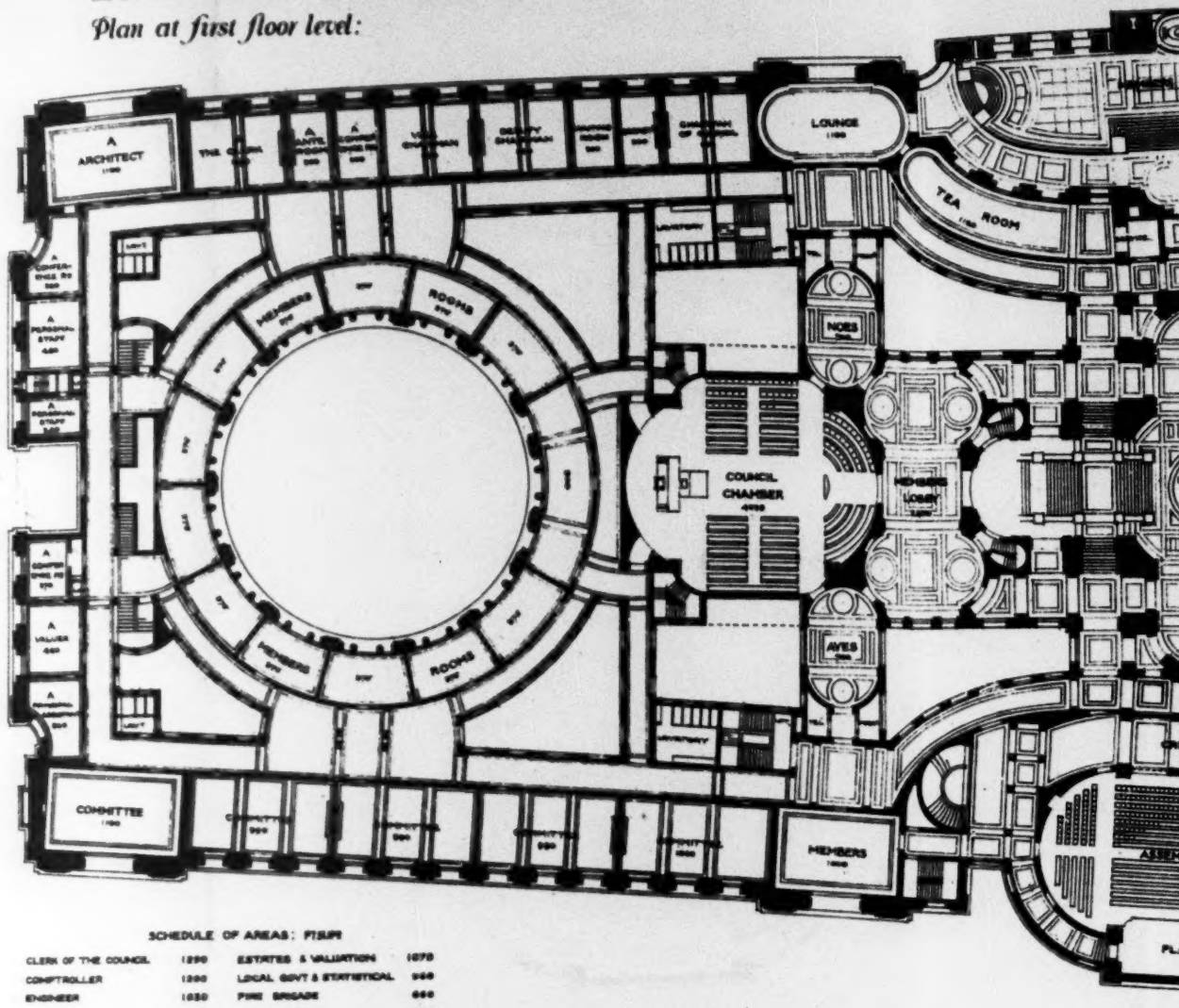
ELEVATIONS AND SECTION.

Scale of 10 5 0 10 20 30 40 50 60 70 80 90 100 Feet

PHOTO-LITHO. SPRAGUE & Co. Lt. 4 & 5, EAST HARDING STREET FETTER LANE E.C.

LONDON COVNTY HALL

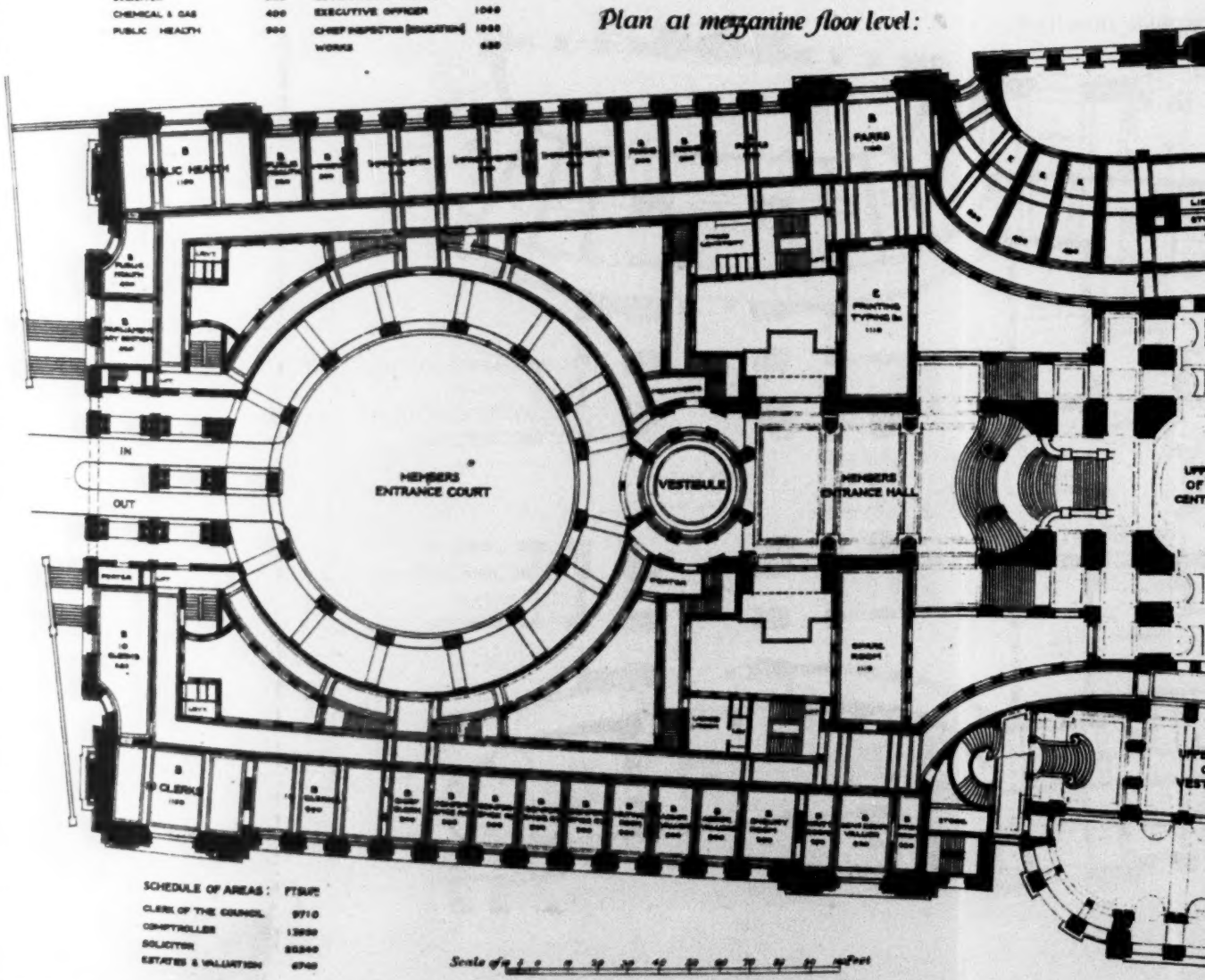
Plan at first floor level:



SCHEDULE OF AREAS: FT.SUP.

CLERK OF THE COUNCIL	1290	ESTATES & VALUATION	1070
COMPTROLLER	1200	LOCAL GOVT & STATISTICAL	960
ENGINEER	1080	FIRE BRIGADE	660
ARCHITECT	2140	TRAMWAYS	960
SOLICITOR	900	EDUCATIONAL ADVISER	660
CHEMICAL & GAS	400	EXECUTIVE OFFICER	1040
PUBLIC HEALTH	900	CHIEF INSPECTOR (EDUCATION)	1080
		WORKS	680

Plan at mezzanine floor level:



SCHEDULE OF AREAS: FT.SUP.

CLERK OF THE COUNCIL	9710
COMPTROLLER	13900
SOLICITOR	85340
ESTATES & VALUATION	6740

DESIGN FOR LONDON COUNTY HALL: SUBMITTED IN THE

PLANS

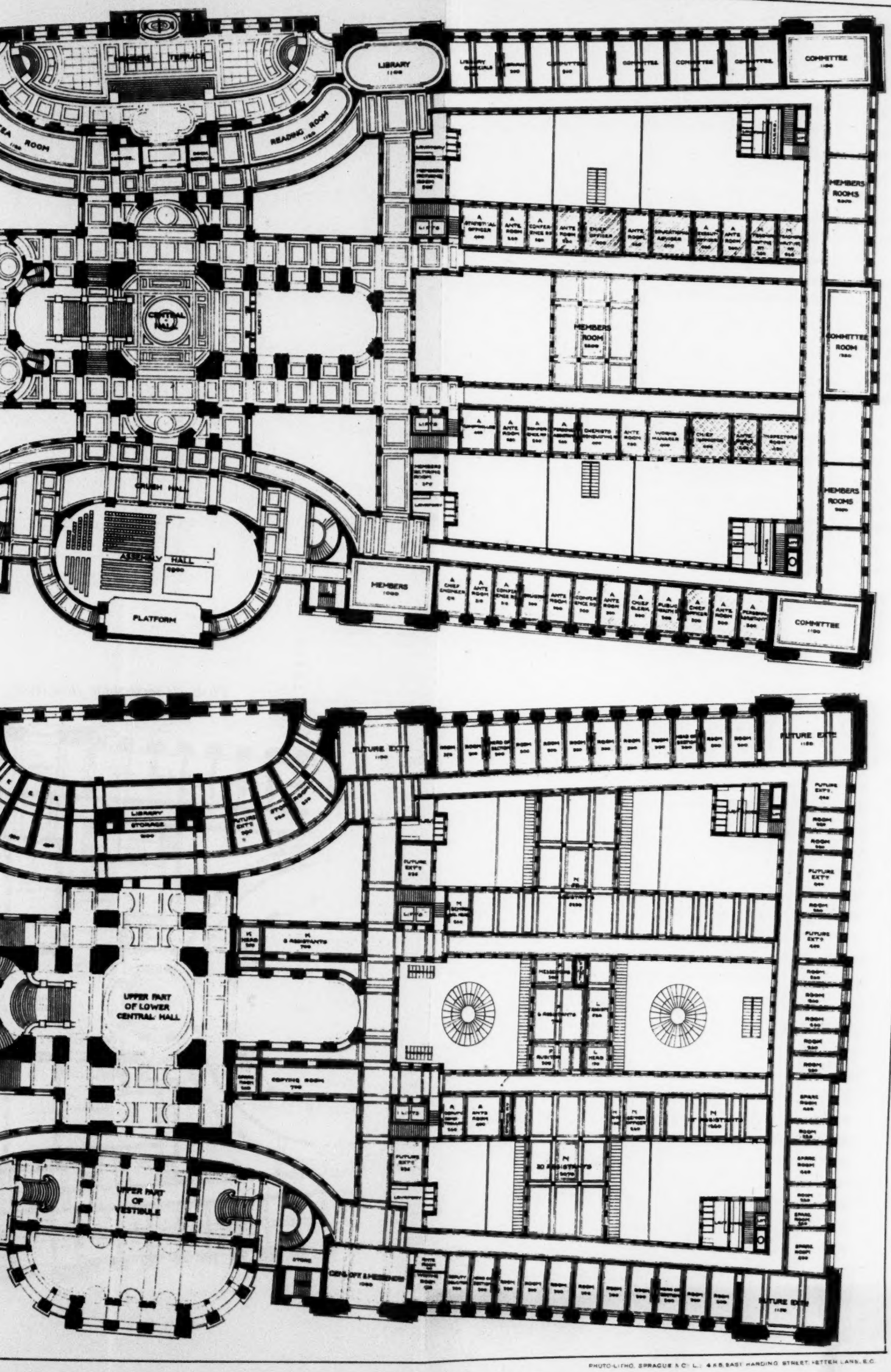


PHOTO-LITHO. SPRAGUE & C° L.T. 4 & 5 BASIL HANDING STREET, HATTON LANE, E.C.

BMITTED IN THE FIRST COMPETITION.—By Messrs. Lanchester & Rickards.

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was approached from the south front, and advantage was taken of the length of this axis to arrange a circular internal court providing ample space for vehicles setting down and taking up without obstruction to the busy traffic of Westminster Bridge-road. The importance of such a court in the case of receptions and other ceremonies is obvious.

At the east end of the shorter axis the official and public entrance opens into an entrance vestibule serving the general offices and the staircases up to the assembly hall.

The effect of the members' entrance hall and the grand staircase leading up to the central hall on the first floor was carefully studied, and this central hall was arranged not only as a reception hall, but as a medium between the principal apartments, viz., the Council chamber and lobbies, the members' lounge, reading-room, and terrace, and also the assembly hall, it having been assumed that for official receptions this portion of the building would form a suite with circulation as effective and convenient as possible; whilst during the ordinary business of the Council the central hall is the point towards which the corridors to the chief officials' and the committee-rooms converge.

It may be noted that the assembly hall could be used independently, having its own crush-hall and staircases.

The members' terrace forms an integral and decorative feature in the design of the river front, and its two levels give the adjacent rooms a better outlook than they would otherwise have.

In the external treatment of this design the aim was to blend the necessarily varied purposes of such a building into a broad and monumental whole, accentuating only the principal features of the composition.

The unusually comprehensive view obtained from across the river demanded a treatment on broad and simple lines, and, though the general scale of the details was considered in relation to modern buildings in the vicinity, and in London generally, the repetition of parts was insisted on throughout in order to secure a breadth of effect enhancing the interest of the central tower and those portions of the design immediately leading up to it.

The sketch published herewith shows the various planes of the features composing this central group. The curved faces of the tower are intended to echo the lines of the crescent formation of the east and west fronts below it, and also to prevent the detection of the slight variation from the parallel of the tower and east and west façades.

Sculptured decoration was suggested only to a limited extent on the general mass of the buildings, but was concentrated on the angle pavilions, the screen to members' terrace, and the large groups flanking the tower. It was suggested that the more important of these groups should symbolise the Metropolis and its Government, and should be of a scale which would render its intention clear from the Victoria-embankment opposite. The remaining sculpture would have been treated in direct relation to this motive."

Fifty Years Ago.

FROM THE *Builder* OF JANUARY 16, 1858.

MILE END OLD TOWN WORKHOUSE.

IT is stated that, when the guardians of Mile End Old Town wanted a workhouse, some short time since, they applied to a number of gentlemen to tender for the appointment of architect, and six did so. The *East London Observer* says:—"The merit of any particular man as a ground of selection was tacitly given up, and the question of cost left as the only one to be decided. The tenders came in. The terms varied, but *one and a half per cent.* on the whole cost of the building was the lowest. The guardians selected one at two and a half per cent., and nominated Mr. Dobson as the surveyor, the difference on an outlay of 40,000*l.* being 400*l.*" And then the local journal in question goes on to scold the guardians for wasting the ratepayers' money by paying 2½ per cent. to their architect when they might get one who would "do the job for 1½."

Architects may see what they are bringing themselves to.

*** It is strange that after fifty years we still from time to time read accounts of appointments of architects on the terms of offering to accept the lowest commission, and find that there are still architects who are willing to countenance such a system in practice. Such a scandal is very rare now, certainly; but surely ere this it ought to have become impossible.—ED.

THE ROYAL INSTITUTE OF BRITISH ARCHITECTS.

WORKS have been received for the Institute Prizes and Studentships 1907-1908 under motto, device, or signature as follows:—

The Institute Silver Medal and Twenty-five Guineas (Essays).—Subject, the function of colour in street architecture.—1, "Arbor Vitæ"; 2, "Bergognone"; 3, "Fiat Lux"; 4, "West Wind."

The Institute Silver Medal and Ten Guineas (Drawings).—Subject, measured drawings of ancient buildings in the United Kingdom or abroad).—1, "A.D. 1382": 6 strainers (Gate House, Thornton Abbey); 2, "Cant Wara": 4 strainers (St. Alfege, Greenwich); 3, "Cantii": 6 strainers (Cobham Hall, Kent); 4, "Dan": 4 strainers (Wolvesey Palace, Winchester); 5, "Fairfax": 6 strainers (Banqueting Hall, Whitehall); 6, "Glan Morfa": 6 strainers (Temple Bar as re-erected at Theobalds Park); 7, "Lancastrian": 4 strainers (Fountain Court, Hampton Court Palace); 8, "Mediæval": 5 strainers (Crosby Hall); 9, "Review": 6 strainers (Wood Hall, Lanarkshire); 10, "St. Andrews": 6 strainers (St. Andrews, Heckington, Lincs); 11, "Sanmicheli": 5 strainers (Gran Gaurdia Vecchia, Verona); 12, "Sanmicheli": 6 strainers (Porta del Palio, Verona); 13, "Spes": 6 strainers (St. Leonard's, Hythe); 14, "Tyke": 6 strainers (St. Mary Woolnoth, Lombard-street); 15, "Victrix Fortunæ Sapienta": 3 strainers (Barrington Court, Somerset).

The Soane Medallion and 100l. (for Continental travel).—Subject, design for a custom house on a quay.—1, "Basino": 5 strainers; 2, "Dovor": 4 strainers; 3, "Fabulosus": 4 strainers; 4, "Florvat": 6 strainers; 5, "Free Trade": 5 strainers; 6, "H.M.S.": 5 strainers; 7, "Hang! I've forgotten the motto!" 6 strainers; 8, "Hippocampus": 5 strainers; 9, "Hope": 6 strainers; 10, "Hylax": 6 strainers; 11, "Ich Dien": 5 strainers; 12, "Levi": 4 strainers; 13, "Lion Rampant": 3 strainers; 14, "Maritime": 6 strainers; 15, "Mecaleep": 7 strainers; 16, "Minerva": 5 strainers; 17, "Neptune": 6 strainers; 18, "No. 13": 4 strainers; 19, "Omega": 4 strainers; 20, "Palladio": 5 strainers; 21, "Red Seal": 6 strainers; 22, "Scarabæus": 6 strainers; 23, "Southern Cross": 6 strainers; 24, "Sphinx": 2 strainers; 25, "Stereo": 3 strainers; 26, "Torus": 5 strainers; 27, "Transire": 8 strainers; 28, "Zoccolo": 6 strainers.

The Owen Jones Studentship: Certificate and 100l. (for travel and study of colour).—Applications and drawings from:—1, Matthew Dawson: 6 strainers; 2, A. E. Martin: 6 strainers; 3, Herman Rosse: 6 strainers.

The Pugin Studentship: Silver Medal and 40l. (for travel in the United Kingdom).—Sets of drawings from:—1, Sidney G. Follett: 6 strainers; 2, N. W. Hadwen: 4 strainers; 3, F. Hearne: 6 strainers; 4, A. D. Robinson: 6 strainers; 5, A. Winter Rose: 6 strainers; 6, Walter P. Rylatt: 6 strainers; 7, A. L. Snow: 6 strainers; 8, J. B. Surman: 6 strainers; 9, Howard M. Travers: 6 strainers; 10, George Vey, jun.: 6 strainers; 11, A. Welford: 6 strainers; 12, T. H. Whittaker: 4 strainers.

The Tite Prize: Certificate and 30l. (for travel in Italy).—Subject, design (according to the principles of Palladio, Vignola, Wren, or Chambers) for an open-air theatre.—1, "Balbus": 4 strainers; 2, "C Minor": 4 strainers; 3, "Dombey": 4 strainers; 4, "Ibis": 4 strainers; 5, "Italia": 4 strainers; 6, "Mafie": 4 strainers; 7, "Palladio": 4 strainers; 8, "Panjandrum": 4 strainers; 9, "Scarlet Scarab": 4 strainers; 10, "Sphinx": 3 strainers; 11, "Tight": 5 strainers; 12, "Veldschoen": 6 strainers; 13, "Volute": 6 strainers; 14, "Yours Truly": 4 strainers.

The Arthur Cates Prize: Forty Guineas.—Drawings have been received from:—Bryan Watson: 6 strainers.

The Grissell Gold Medal and Ten Guineas (for design and construction).—Subject, design for an elevated water tank in reinforced concrete.—1, "A B C": 2 strainers; 2, "Cottambique": 6 strainers; 3, "Delta": 3 strainers; 4, "Gutta": 3 strainers; 5, "Homogeneous": 4 strainers; 6, "Jack Sprat no fat, His wife no lean": 4 strainers; 7, "Stef.": 5 strainers; 8, "Water Mark": 4 strainers; 9, "77": 3 strainers.

Godwin Bursary: Silver Medal and 65l.—1, J. A. G. Allan: 6 strainers; 2, Cyril E. Power: 1 portfolio; 3, A. Halcrow Verstage: 6 strainers.

The Henry Saxon Snell Prize: 60l. (hospital design and construction).—1, W. Greenwood: 5 strainers; 2, Wm. Laing: 4 strainers; 3, Gavin Lennox: 5 strainers; 4, W. Milburn, jun.: 4 strainers; 5, A. E. Spackman: 4 strainers; 6, W. H. Ward: 4 strainers.

STUDENTS' PRIZE DESIGNS AT THE INSTITUTE.

WE may draw attention to the fact that we are always willing to publish among our illustrations the successful designs for the Soane Medallion, the Tite Prize, and the Grissell Medal, presented by the Institute of Architects. It is as well to make this clear, because on several occasions prize-winners in these subjects have expressed their great regret that they were unable to avail themselves of our offer to publish their designs, a promise having been previously extracted from them to publish them elsewhere.

THE SURVEYORS' INSTITUTION:

FORESHORE EROSION AND RECLAMATION.

AN ordinary general meeting of the Surveyors' Institution was held on Monday at No. 12, Great George-street, Westminster, S.W., Mr. T. T. Wainwright, President, in the chair, when Professor Henry Robinson read a paper on "Foreshore Erosion and Reclamation." Having referred to the appointment by the Government in 1906 of a Royal Commission to inquire into the subject and to some of the cases brought before it, he said it was to be hoped that the result would be the formation of a State Department empowered to deal with erosion and to recommend and assist in carrying our remedial or preventive works as well as to obtain and record data relating to currents, soundings, changes of foreshore, etc., round our coasts. Such observations being taken frequently, deductions therefrom could be promptly made. The State Department should have power equitably to divide the cost of the protective works between the county or district councils and the owners of the land abutting on the foreshore to be dealt with. If a State Department had the powers vested in it that were suggested, the solution of the question of foreshore erosion and protection would be far less difficult from an engineering point of view than it might appear to be. The cost of protective works would be adjudicated upon by the proposed Department, and need not be met altogether by a Treasury grant. The local authority, and the owners of land benefited by the protective works, might be required to contribute towards the cost, there being no legal or other obligation on a person or an authority to expend money to protect coasts for the benefit of the community. At the present time the Treasury makes grants in respect of new works, or of improvements to harbours used for refuge or fishery purposes, the amount being limited to one-third of the outlay on such works. In Holland and Belgium the Governments of both countries carry out and maintain the groynes and sea walls which are required for the protection of their coasts, such being regarded as a matter of national concern.

The lecturer then referred to the Crown rights and obligations, and, having quoted the judgment of Lord Justice Fry in 1879 that there was a prerogative and duty in the Crown to protect land from the inundation of water for the benefit of the commonwealth, said that landowners could not be expected to incur the cost involved in carrying out protective works for land which had merely an agricultural value, and had not been developed for building and similar purposes. If agricultural land had to be preserved to prevent injury to adjoining property, the State, or the public bodies whose interests were prejudicially affected, must bear the burden. The loss of foreshore on the east coast had led in some cases to the destruction of villages which existed in olden times, but over the sites of which there were now several fathoms of sea.

Attention had generally been confined to the *visible* effect of storms on our coasts, while the consideration of what was known as deep sea erosion, or erosion below low water level, had been too much neglected. It was essential, however, that this important part of the subject should be studied, for many works carried out to protect the visible foreshore above low water would probably in the course of time be undermined by the erosion in deep water of material from the bed of the sea at some distance from the place where they had been executed. The efforts to remedy the evil of erosion had been too often confined to the changes visible on the foreshore between high and low water, disregarding what occurred below. Many examples of this would be given. At Peterhead breakwater, where the rise of the spring tides did not exceed 11 ft., it was found during a storm in 1898 that blocks weighing more than 40 tons were displaced

at a level of 37 ft. below low water spring tides. At Land's End, lobster creels lying in 20 to 30 fathoms of water were found, after a heavy gale, to be filled with sand and shingle, some stones weighing a pound. That waves act on the material at the bottom of the sea at depths of 30 or even 40 fathoms was proved by the attachment to the material at those depths of deep seaweed, which assisted the sea in disturbing the sea-bed, and conveying it towards the shore with a corresponding increase in the depth of the sea landwards. The effect of drift in deep waters could be studied where the Admiralty charts, with corrections over long periods, gave information as to what changes, either in the form of accretions or the reverse, had occurred along the coast under consideration. The results would serve as a guide to what should be done along the foreshore itself. These Admiralty charts afforded data with regard to depths of water for navigation purposes, but not a record of the currents which affect foreshores.

Those who were called upon to advise concerning foreshore protective works must know how tides, waves, and winds combine to cause erosion or other damage. The coincidence of a high spring tide and an on-shore gale produced the maximum effect. If, however, the prevailing winds be not directly on shore, this fact must be taken into consideration in designing works for the retention and the accumulation of the material that was drifting along the coast, to protect it from erosion, or to recover the foreshore which had been lost for want of such works. It was necessary to observe the range of the tide, the direction and intensity of prevalent and most destructive winds. On the east coast the direction of the drift was from north to south; on the south coast it was from west to east. An interesting case was that of the river Dee, where, some years ago, he was called upon to advise whether the injury to the earthen embankment which protected the low-lying land between the river and the North Western main line to Holyhead, which had been partly wasted away by heavy gales, was likely to continue. On investigating the matter, he found that for several years works near the entrance to the river had deposited slag and other solid waste on the foreshore, making a bank seaward and so narrowing the entrance. Coincident with this, he found from the seafaring men that craft could now enter the river at all tides over a bank, the depth of water on which had gradually increased. This was due to the ebb tides discharging from the river through a narrower channel than previously. This indicated what had taken place, namely, that in heavy gales from the north-west and at spring tides, a vastly greater amount of water was hurled against the protective bank that he had to deal with, and he advised the immediate construction of temporary defensive works to prevent, what was imminent, the failure of some part of the bank in the next storm, and the consequent flooding of the low-lying land up to the railway. This was done, and subsequently permanent defensive works were carried out.

The effect of wave action required careful consideration, as it varied round our coasts. At Dover the highest waves were from 15 to 18 ft. from crest to trough, whereas on the north-east coast at the mouth of the Tyne, waves had been recorded from 35 to 40 ft. from crest to trough, and at Peterhead (where the Admiralty were making a harbour of refuge) waves of a similar height to those at the Tyne had been recorded. In addition to the material eroded from cliffs and foreshores, rivers brought down from the land much detritus, part of which formed banks at the mouths of such rivers or estuaries, the rest being carried seaward. Land springs were sometimes also a contributory cause of slips in cliffs, with the resultant increased erosion. The action of underground water flowing from the land seaward had not only led to slips of banks on the foreshore, but also to the disturbance of the sea-bed in deep water. The land adjoining a coast was often drained by conveying the rainfall or springs to the nearest part of the cliff, and letting it run down the face of it to the sea. This leads to the breaking up of the cliff, and consequent slips. Sometimes the drain-pipes, or channels, were carried down the cliff to high-water mark only and not beyond. The flow of this water along the foreshore tended to prevent accretion. It should be carried by culverts to low water.

The author referred to some of the means that were adopted to retain the littoral drift that passed down our coasts which are now subject to erosion. These sea defence works might be in the form of sea-walls, breakwaters, or groynes. A sea-wall, either with or without an apron or a rubble wall, would afford protection against the direct attack of the sea. In some cases sea-walls had been relied upon as a protection, but although they were often serviceable as promenades at pleasure resorts they did not afford a certain means of preventing erosion. In one case within his experience a sea-wall constructed with a vertical face was the cause of increased erosion, as the waves swept down the face, and in a short time cleared away several feet of shingle below the footings of the wall, and if the toe had not been promptly protected, and groynes placed in carefully selected positions to collect the foreshore drift, the wall would have been destroyed, and matters left worse than at the outset. At another place, a sea-wall which had been built without proper protection being provided for the backing, ultimately developed serious cracks due to heavy seas passing over the wall and damaging the backing. Sea-walls for the protection of banks could be constructed with an apron, which caused the waves to be deflected horizontally on to the foreshore instead of passing downwards as in the case referred to above. In some cases blocks of concrete had been placed irregularly in front of a protective wall to act as breakers to the large waves which, during a gale, would have struck the wall with great force and passed over the top of it. The waves on striking the blocks were broken up among the interstices. Banks were often protected by rubble walls, or a timber-framing filled with stone, chalk, or other material, giving weight to the structure. If erosion had to be remedied, groynes of suitable design and position would arrest the travelling eroded material, and would not only stop further loss of foreshore, but would raise its level by accretion. The position of the littoral drift, which was collected by groynes or similar works, on their windward side, interfered with the passage of any part of it to the leeward side. If any did travel it would be carried into deep water, as it was washed along the coast past the ends of the groynes and the accumulated material between. Groynes should be constructed in such a way as to minimise their deterioration or destruction; but consideration had often to be given to the question of cost, which might impose a greater burden than the estate could well bear. The groynes might be constructed of timber alone, or with the addition of rubble, or of stone work, or of "reinforced concrete," or they might be "cable groynes." The adoption of one or the other form, their position, number, distances apart, and other essentials, could only be determined by a skilful consideration of each case. The positions of groynes were often fixed without due regard to the conditions that would ensure the accretion of shingle evenly on both sides. If they were placed at right angles to the coast, an accumulation might take place on one side, which would result in heavy seas breaking over that side and denuding the foreshore on the other side, causing not only a most unsatisfactory result as regards the foreshore itself, but also in time endangering the stability even of the groynes.

Whilst parts of our coast lost by erosion, others gained by accretion, but there was a general agreement among those who had studied the question that the value of the land lost by erosion was far greater than of that which was reclaimed by natural accretion. In fact, there were many sea-ports round our coast which had deteriorated as ports in consequence of the entrances and channels being injuriously affected by such accretions. The reclamation of areas of bights of slob land near the entrance of a river over which the first part of the flood tide was dissipated, resulted in a larger volume of water passing into the river and reaching a higher part of it. This was discharged at the end of the ebb tide, with a consequent increased scouring effect at the entrance. This increased scouring had often resulted in the littoral drift, which, lodging at the entrances to the rivers, formed bars, being carried seaward into deep water, and the great improvement of the navigable channel. From an experience extending over many years, he could record the benefits that had accrued to rivers and ports by the reclamation of bights, and the straightening of channels. The Humber was an example. Many years ago he had occasion to advise as to the desirability of reclaiming the slob land inside Spurn Point. By comparing old charts with charts of that time, he was able to show that a marked increase in the depth of water in the navigable channel had occurred, coinciding with the period during which the reclamation of the bight of slob land inside the entrance had been slowly progressing by means of stakes and kids. He advocated the reclamation being accomplished more quickly by means of an embankment.

The author referred to some of the groynes which had been employed, and in conclusion, he said that the removal of shingle, sand, and such materials from foreshores for building, road-making, and other purposes was often carried on without due consideration of the consequences. He had to investigate cases where it was alleged that, at the point where the beach was lowered, by the abstraction of the material composing it, no harm could accrue, but where a very little study of the locality was required to show that the reductions of the level of the foreshore there enabled the sea at high tides and winds to pass over it and attack an adjoining foreshore, doing irreparable injury. It was true that where material was being removed from a foreshore with injury to the locality, the Board of Trade had power to issue a Prohibitory Order under the Harbours Transfer Act of 1862.

A discussion followed, and a vote of thanks was heartily accorded to the lecturer.

Architectural Societies.

LIVERPOOL ARCHITECTURAL SOCIETY.—The Council intend to hold a dinner to commemorate the sixtieth anniversary of the founding of the Society, on Saturday, February 1. Members of the Society have been invited to send in competition designs for a *menu* card for the occasion, the President to act as assessor in awarding the prize.

BOOKS RECEIVED.

ELECTRIC WIRING AND FITTING; for Plumbers and Gasfitters. By Sidney F. Walker. (Scott, Greenwood, & Son. 5s.)

TOWN PLANNING IN THEORY AND PRACTICE: Papers and Speeches. (Garden City Association. 1s.)

LOCKWOOD'S BUILDERS' AND CONTRACTORS' PRICE-BOOK FOR 1908.—Edited by F. T. W. Miller, A.R.I.B.A. (Crosby Lockwood & Son. 4s.)

ROMAN HAYLING. By Talfourd Ely, F.S.A. Second Edition. (Taylor & Francis. 3s.)

THE LONDON MASTER BUILDERS' DIARY AND HANDBOOK FOR 1908. (Unwin Brothers. 2s. 6d.)

Correspondence.

THE DANGERS OF BUILDING.

SIR,—In your issue of the 11th inst. you remark as follows:—

"Two or three witnesses speak strongly, but not too strongly, as to the folly of 'blocking up' scaffolding or ladders on extempore piles of bricks or other materials to hand; but that, we may observe, is essentially a workman's and not a contractors form of dereliction. A competent clerk of works ought to stop it."

May I point out that, excepting for his own safety, a clerk of works would be very ill-advised to interfere with a scaffold of this description, or with any other scaffold, unless it happened to be put up in such a manner that it would affect the quality of the work or building?

By so interfering he would not only be placing himself in the position that he could be told by the contractor to "mind his own business," but would also be taking upon himself the responsibility for the scaffold, so that in the event of an accident occurring later he could be called upon to render an account, probably to the full extent, for the security of the scaffold. This is no part of a clerk of works' duty, and he will be a wise man not to accept the responsibility, except for his own safety.

W. T. B.

*** Our correspondent may be right, in a sense, but the view that he suggests seems a narrow and selfish one. Is building etiquette more important than men's lives?—ED.

The Student's Column.

REINFORCED CONCRETE BEAM FORMULÆ.—III.

NOTATION AND ALGEBRAICAL FORMS (*continued*).

(4) *Symbols for Linear Measurements.*—Referring to the symbols and expressions in Table I. we find that no difficulty occurs in connexion with measurements of breadth, for with a few unimportant exceptions the letter b, which is generally used to denote the breadth of a beam in English-speaking countries, has been adopted by nearly all the authorities quoted in the table.

It is easy to understand that French writers prefer the letter l as the initial of the word *largeur*, but their use of the letter a it not particularly intelligible, nor is it clear why one American author should have gone out of his way to bring in the letter z.

The most natural course is to denote the breadth of a rectangular beam or the rib of a T-beam by b, and the breadth of a T-beam flange by b_1, as in Fig. 2.

These symbols are perfectly suited to the requirements of all formulæ in general use.

For the effective length, or clear span, of a beam writers on construction have never been quite in agreement as to the claims of l and L, and writers on reinforced concrete are to some extent divided in opinion on the same point. As the small letter is more frequently used than the capital letter, and as l is far more easily written and looks neater than L, it deserves general adoption.

For indicating part lengths of a beam such as have to be taken into account for the computation of bending moments and shearing forces, and for other determinations, the letter l with a suitable suffix might also be used without leading to confusion.

For the two main vertical dimensions of a reinforced concrete beam most of the authorities mentioned in Table I. prefer h = total depth and d = effective depth.

Either of these symbols would suit all the formulæ save that of Professor Hatt wherein the effective depth is considered in its relation to the total depth and the ratio of the two dimensions is employed as an essential factor. An exceptional formula of this kind should be dealt with specially, and need not be allowed to interfere with the uniformity of notation for other equations.

An objection to h = total depth is that engineers who have been accustomed from their youth upwards to denote the total depth of a beam by the symbol d ought not to be asked by people who have recently come on the scene with formulæ for beams of a new structural material either to change an established practice or to denote two different measurements by one symbol.

It is true that some writers have used h to signify total depth, but the use of d for the same measurement is more usual, and is more natural, being the initial letter of the word depth.

If this view be accepted we have next to decide upon a symbol denoting the effective depth, or, alternatively expressed, the height of the upper fibres of the beam above the axis of tension in the reinforcement.

The symbol h is so used by some of the authorities mentioned in Table I., and has already been employed for analogous purposes in various treatises on ordinary construction. Its application to formulæ for beams of reinforced concrete obviates the inconvenience of using d with a suffix, creates a clear distinction between the factors represented by h and d, and leaves d free for use in the same way as it is used in other equations, such as those relating to moments of inertia and radii of gyration. For these reasons, it seems desirable that d should denote the total depth and h the effective depth of a beam, as indicated in Fig. 2.

Next, we come to other dimensions of the same series indicated in Fig. 3, and numbered for ready identification, the numbers being the same as those in the margins of Table I. In formulæ where the ratio method is followed all these dimensions except (1), (3) and (12) bear clearly defined relations to the effective depth (2).

This point is demonstrated by the expressions used in the formulæ of Messrs. Taylor and Thompson, whose notation is suitable for the absolute system as well as for the ratio system.

On the contrary, none of the various systems of notation adopted by authorities employing absolute measurements can be used in ratio formulæ for the dimensions now in question.

Examination of the symbols and expressions in Table I. for dimensions (3) to (11) demonstrates the widely-diverging ideas of various authorities as to appropriate notation, the complication to which simple symbols for individual measurements give rise when applied to the formation of expressions for other measurements, and the lack of consistency in some of the series of symbols.

No words could possibly plead so eloquently the cause of standardisation as do the symbols and expressions to which reference is here made.

It will be noticed that six authorities agree in the compound form of symbol for dimension (4), but there is a difference of opinion concerning the qualifying ratio, which is variously designated as k, x, and z.

The British Reinforced Concrete Committee appear to have followed the lead of Professor Talbot in using k, which is not happily selected because the same letter is very generally used to denote a *coefficient*.

The letter x in one way or another is used by six out of the sixteen authorities named in Table I., and is more largely employed than any other letter of the alphabet to denote the position of the neutral axis in reinforced concrete formulæ. It has also been used for a similar purpose by writers on general construction, but far less than the letter y, which also is favoured by several of the authorities quoted in Table I. as the symbol denoting the depth of the neutral axis.

Notwithstanding the slight predominance enjoyed by y over x, the latter may advantageously be retained for expressing the relation $\frac{hx}{h}$, and its use is particularly appropriate in view of the fact that the value in question is the most important unknown quantity for determination in a reinforced concrete beam.

Then, accepting h = effective depth, and x = the ratio of the depth of the neutral axis to the effective depth of a beam, we naturally obtain:—

hx = the depth of the neutral axis, Fig. 3 (4).

$h(1-x)$ = the distance from the neutral axis to the centre of tension in steel, Fig. 3 (5).

$\frac{1}{3}hx$ = the depth of the centre of compression in concrete, Fig. 3 (6).

$\frac{2}{3}hx_1$ = the distance from the centre of compression in concrete to the neutral axis, Fig. 3 (7).

$h(1-\frac{x}{3})$ = the distance from the centre of compression in concrete to the centre of tension in steel, Fig. 3 (8).

Similarly, disregarding a, d, d^1, d_1^1, and k, as inappropriate symbols to denote the depth of the centre of compression in steel, or the ratio of the depth of the centre of compression in steel to the depth of the centre of tension in steel, and taking u as a letter associated mentally with x, and therefore naturally applicable to kindred purposes, we obtain:—

hu = the depth of the centre of compression in steel, Fig. 3 (9).

$h(x-u)$ = the distance from the centre of compression in steel to the neutral axis, Fig. 3 (10).

$h(1-u)$ = the distance from the centre of compression in steel to the centre of tension in steel, Fig. 3 (11).

We will next settle a letter for denoting the thickness of concrete below the centre of the reinforcement in tension, Fig. 3 (3).

By referring to Table I. it will be seen that twelve of the authorities mentioned have adopted no fewer than seven different symbols. Four of them agree in using e,

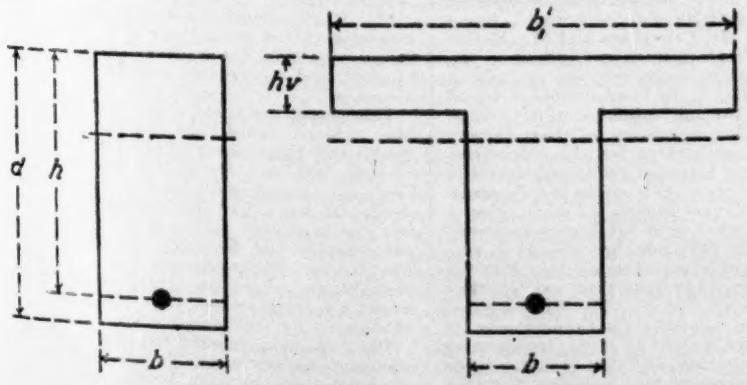

Fig. 2.

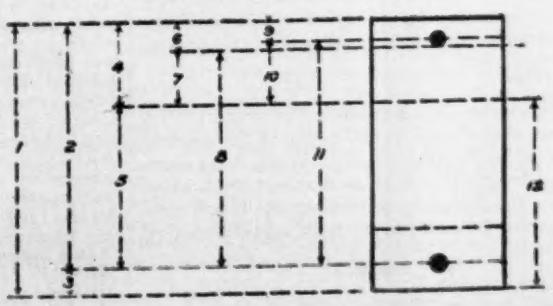

Fig. 3.

probably because that is the initial letter of the expression *extra concrete*; two of them use d' and d_1 which would be consistent with the employment of either d = effective depth or d = total depth; and three use letters belonging to what may be termed the x group of the alphabet, whose application to absolute measurements would tend to confusion because some of the series are necessary for ratios or relative measurements.

Of course either y or z could be used as a ratio and hy or hz as an absolute measurement of the depth of concrete below the centre of compression in the steel. But as the depth of concrete so placed is governed chiefly by considerations of fire protection and not by mechanical principles, it is better that the dimension should be treated as an absolute measurement akin to that of total depth. As we have already decided to denote the total depth of the beam by d, it seems most appropriate to indicate by the symbol d_1 a part of that depth which is entirely outside the effective depth h, and has nothing to do with the calculated strength of the beam.

The notation proposed above is suitable for both the "absolute" and the "ratio" modes of computation, and could easily be extended for application to formulæ based upon the parabolic stress-strain theory.

Finally we have to consider what symbol should be chosen to indicate the depth of flange in a T-beam.

Table I. shows that nine of the authorities mentioned have chosen symbols of which no two exactly agree, and of which only three are consistent with the symbols representing either the effective or the total depth. The treatment of the dimension in question shows very clearly the need for mutual agreement concerning notation.

In nearly all theories of reinforced concrete the concrete below the centre of the reinforcement is regarded for the purposes of calculation as if it were non-existent, only the concrete above that level being taken into account.

Therefore if d = the effective depth of a beam, an obvious course is to denote by d_1 the depth of a T-beam flange, as in the notation of the Committee of the Royal Institution of British Architects. Or, if h = effective depth, h_1 would appropriately denote flange depth. The capital letter D used by one authority is inadvisable, because capital letters should be reserved for the indication of total or collective values and for the reason that they are not so easily written, and are not so neat as small letters.

Why the other authorities quoted should think of ϵ, e, E, r, and s, in connexion with a kindred measurement which they denote by d, h, or H, is a question that cannot be answered, except on the hypothesis that the symbols have been used at random without any attempt to secure consistency of notation.

But while d_1 or h_1 would be quite consistent with d or h, it happens that in some calculations for T-beams, both with single and with double reinforcement and where the neutral axis is below the under surface of the flange, it is convenient to consider the ratio of the depth of the flange to the effective depth of the beam.

Hence, instead of h_1 we can advantageously use hv (see Fig. 2), a symbol which agrees in form with hu and hx, and places at disposal the ratio $\frac{hv}{h} = v$.

Of course, in cases where the depth of the flange is the same as the depth of the neutral axis, $hv = hx$ and $v = x$. There is no more objection to this than to the fact that when using the notation of the British Reinforced Concrete Committee we may sometimes find $d_1 = kd$.

FREE LIBRARY, MAXTON, N.B.—A free library has been opened at Maxton, near St. Boswells. Mr. Macniven, architect, Edinburgh, designed the building.

TRIBUNAL OF APPEAL CASE:

ECCLESIASTICAL COMMISSIONERS v. LONDON COUNTY COUNCIL.

THE Tribunal of Appeal sat at the Surveyors' Institution on Tuesday to hear an appeal by the Ecclesiastical Commissioners for England, under sect. 19 of the Act of 1894, against the order of the London County Council, dated November 26, 1907, refusing to sanction the formation or laying out of a new street for carriage traffic in construction of Bloemfontein-road, Hammersmith, and leading to Sawley-road, as shown by the plan, sections, and particulars dated October 30, 1907, submitted on behalf of the appellants by Messrs. R. B. Grantham & Son with their application to the Council. Mr. H. Lloyd, K.C., and Mr. Dighton Pollock appeared for the appellants, and Mr. Ryland Adkins, M.P., for the London County Council.

Mr. Lloyd, K.C., in opening the case, said that the Ecclesiastical Commissioners were the owners of a large estate at Hammersmith, off the Uxbridge-road, and which was being developed. One part near Wormwood Scrubs had been sold to the London County Council for workmen's dwellings, while another site had been purchased by the Hammersmith Board of Guardians. A large plot had been sold to St. Paul's School for a recreation-ground, and one or two sites had been sold to the London County Council for schools. To the south-west of the estate there was land leased for building purposes, and intersecting that plot were various roads, and adjoining was the Oaklands Estate, belonging to a Mr. Axton. The first application made in respect of this portion of the estate was in March, 1904, when the Commissioners asked the County Council to sanction a number of new streets. The County Council then made an order sanctioning the streets, subject to the condition that they were properly fenced and opened to the public within a year. Later on the Commissioners desired to abandon certain of the streets, and a further application came before the County Council on January 31, 1905, when the Council sanctioned the plans. In November, 1905, the Hammersmith Borough Council approached the Ecclesiastical Commissioners and asked them if they would lay out some of the roads in order to afford work for the unemployed. Although the Commissioners did not want to commence such work, yet, to meet the wish of the Borough Council, they made appplication to the County Council for sanction to construct a new street which would be a continuation of the Bloemfontein-road. The County Council said they would sanction the scheme on the condition that the Commissioners entered into a covenant to continue the road to lead into another one, and, as the conditions were too stringent, they decided not to carry out the work. In 1904 it appeared that the County Council had sanctioned the formation of Adelade-road, Collingborne-road, and Halsbury-road on Mr. Axton's estate, and the Halsbury-road was shown on the plans as running into the Bloemfontein-road. Mr. Axton died, and then it was ascertained that the Ecclesiastical Commissioners owned a strip of land which prevented the carrying of the Halsbury-road into Bloemfontein-road. Mr. Seager Berry, the then solicitor to the County Council, wrote on March 5, 1906, pointing out these facts, and asking if the Commissioners would come to some arrangement with the owners of Mr. Axton's estate. The result was that the Commissioners did sell a piece of land to Mr. Axton's representatives which enabled the Halsbury-road to be carried through, but the same difficulty prevented the extension of Adelaide and Collingborne roads. On February 4, 1907, the Commissioners made a third application in regard to a continuation of the Bloemfontein-road, and the County Council refused to sanction it on the ground that the new road did not afford direct access between two streets properly laid out. The Commissioners wrote that they could not understand the decision, inasmuch as the suggested road did afford direct communication between Wormholt-road and Bloemfontein-road. At an interview which Mr. Grantham and Mr. Butler held with the Superintending Architect, the roads on the Axton estate cropped up, and it was intimated that if the Commissioners would provide outlets for the Adelaide and Collingborne roads the objections of the County Council to the application for the new street might disappear. Messrs. Clutton subsequently wrote that they could not advise the Commissioners to make new streets so as to give a continuation of what were cul-de-sacs approved by the Council in 1906, but they offered to give the land necessary to make connexions with the Axton estate provided that that was all they should be called upon to do. Mr. Riley replied that the position taken by the Council was for the benefit of the public at large, irrespective of different ownerships, and that the offer made by the Commissioners was not one that the Council had had to deal with before, and was a matter for arrangement with the other owners. As the time for an appeal to the Tribunal had lapsed, the Commissioners made a fourth application to the Council for a prolongation of Bloemfontein-road, and this was refused on the same grounds, which, as a matter of fact, applied in the case. On July 26 1907, an application, practically the same as the one which the Tribunal had now to decide, was made to the Council, and was refused by the Council on the same grounds. An interview was held with Mr. Seager Berry, and it was again stated that if the difficulty with regard to the roads on the Axton estate could be got over the objection of the Council to the Commissioners' proposal might probably disappear The representatives of the Commissioners said they could not see their way to do more than they had already offered. Then on November 26 they made their last application to the Council, and, as this was refused on the ground that direct communication was not given between two streets already laid out for traffic the present appeal was brought. How it could be said that the proposed new road did not furnish direct access between Bloemfontein-road and Sawley-road he did not know.

Mr. R. Clutton, of the firm of Messrs. Clutton, Surveyors to the Ecclesiastical Commissioners, produced a plan of the estate, and explained the portions which had been sold.

The Chairman said that the view the Tribunal took was that neither the County Council nor an owner had any right to barter the interpretation of the Act in order to get a public or a private advantage. The ancient history did not affect them.

Mr. Lloyd said his difficulty was this: It looked rather as if the intimation they had received from the County Council showed that the Council were taking a somewhat strict view in reference to the position of the Ecclesiastical Commissioners in order to induce them to make some arrangement with the adjoining owner.

The Chairman said that did not affect their mind. They had to decide strictly whether there was direct communication between two streets. It was a question of fact simply.

Mr. Lloyd said that up to a point he agreed, but some question of law might arise.

The Chairman said they were dismissing from their minds any question of bargaining between owners and the County Council as to whether they should give access to different parts of an estate. It ought not to enter into their minds at all.

Witness said the Bloemfontein-road had been open for some years for traffic, and the proposed new road ran from that road into the Sawley-road and into the Sedgford-road. Sawley-road and the southern end of Sedgford-road was made up, curbed, and channelled. Sedgford-road was now being made up by the local authority for the purpose of being taken over. Sawley-road was not yet being taken over by the local authority. In his opinion the new road gave direct access between the Bloemfontein-road and the Sawley-road.

Replying to Mr. Ryland Adkins, witness said, in his view, the definition of direct access was an uninterrupted access from one point to another, and angles and curves were irrelevant. There were no geographical difficulties to making a straight road from Sawley-road to Bloemfontein-road, but Axton's estate intervened. He was not aware that the view of the County Council was that a right angle, either disguised as a curve or not, was not a direct communication, and, as a matter of fact, the Council had sanctioned a number of roads which were curves. The curve in this proposed road was practically the same as the curve in Regent-street, and he would certainly call that a direct access.

Mr. R. H. Grantham, engineer, said that he and Mr. Butler, of the firm of Messrs. Clutton, were present at the interview on May 3 with Mr. Riley, the Superintending Architect, who said the difficulty might be got over if they would allow the streets on Axton's estate to communicate.

Mr. W. H. Foster gave evidence as to the interview which took place with Mr. Seager Berry, the solicitor to the London County Council, and was corroborated by Mr. B. Mar Johnston.

This closed the case for the appellants, and Mr. Adkins called Mr. Millward, of the Architect's Department of the London County Council, who said the ground for the County Council's refusal was that the proposed new street did not afford direct communication to two streets already laid out for traffic. He did not consider that the street, curved as it was, was direct. He considered "direct" meant straight as a bee line. He thought the new street was inconvenient from the public point of view.

The Chairman pointed out that no doubt it was an excellent policy to try and insist on communication between estates which would prevent public improvements in years to come

but what was the use if the Council had not the power? They were prepared to assist the Council if they could, but in this case the Council had had an offer which, so far as he was concerned, seemed very fair.

Mr. Adkins pointed out that the cost of making outlets from estates had always been borne by the persons developing the estate.

The Chairman said that was because the owners were willing to do it. The Tribunal had never allowed any question of inter-communication to be made a leverage for any other purpose. They had made suggestions when both parties were endeavouring to get together to carry out some particular scheme.

Mr. Adkins remarked that the Council were most anxious to facilitate the development of the estates, but, at the same time, they were anxious to do it in such a way that the public might be advantaged with the least cost to the private owners.

The Chairman: What ought to be done is for a short Act to be passed to enable the County Council to purchase the small pieces of land necessary for making communications between the estates, and to allow the Council to apportion the charge.

Mr. H. Mair, Surveyor to the Hammersmith Borough Council, said his Council refused the application of the Commissioners because of the want of communication between their estate and the Axton estate. The Commissioners offered to give up the land to make the necessary connexions if the Council would themselves make the roads; but his Council doubted whether they had legal authority to do this.

Mr. Ryland Adkins addressed the Tribunal at some length, and said that the County Council said in the first place that this was not a direct road, and therefore they considered they could exercise their discretion in the interests of the appellants if the Commissioners would facilitate the public interest in the matter of inter-communication. He argued that the very reason this discretion was given to the County Council was that they might use it in the public interest. It could not be said that the proposal of the Commissioners was in the public interest. It was a winding road round another estate, and the owners ought not to be allowed to do it unless they consulted the public interest at the same time. It was true that if the Tribunal laid down the conditions that the Commissioners should make the necessary outlets for the roads from the Axton estate that it would mean some expense to them, but that was a cost which ought properly to fall on owners of building estates who get all the advantages of the metropolitan services. He unhesitatingly argued that "direct road" meant the shortest road possible.

The Chairman pointed out that to get the shortest possible road between Bloemfontein-road and Sawley-road it would mean pulling down houses.

Mr. Adkins said he frankly admitted that, if the owners pointed this out to the Council, they would be justified in saying that local conditions prevented the making of a straight line, and would, in the public interest, allow a different line.

The Tribunal upheld the appeal and awarded 60 guineas costs.

REINFORCED CONCRETE FLOOR TEST.

On April 30, 1907, a test was made by Messrs. David Kirkaldy & Son to ascertain the behaviour under test load of a reinforced concrete floor built at Kingsway House, Holborn, by the British Fireproof Construction Company. The floor is situated at ground level, and is of irregular outline, somewhat resembling the profile of a boot in plan. The area loaded measured 10 ft. 6 in. by 4 ft. 6 in., the clear span between supports ranging from about 8 ft. at one end to 15 ft. at the other.

According to Messrs. Kirkaldy's report the floor was 7 in. thick, composed of 6 parts furnace ash to 1 part of Portland cement by volume, and the reinforcement consisted of 1-in. by 1-in. tee-bars inserted across the span at intervals of 10 in. apart. It is not stated in the report whether the bars were laid flat near the under surface of the concrete, or were bent upwards near the supports, as we believe the reinforcing bars are generally applied in floors of this description.

The floor was completed on February 25, and so at the date of the test was sixty-four days old. As the loading had already been placed on the floor before the conduct of the test was entrusted to Messrs. Kirkaldy, it was impossible for that firm to measure the deflection due to increase of load, and the only thing to be done was to observe the recovery or rise at the centre as the load was removed. The loading consisted of 145 bags of cement in thirteen tiers or layers, representing a total weight of 30,740 lb., or 13·7 tons. When all the bags had been removed the recovery of the floor at the middle of the span was 0·088 in., and two and a half hours afterwards there was a further vertical rise of 0·136 in., making the total recovery of 0·224 in., which, the report says, "may be taken to represent the deflection of the floor when it was under the full test load of 13·7 tons."

The suggestion is certainly one that cannot be accepted without definite information as to the entire absence of permanent set after the last measurement was taken. As Messrs. Kirkaldy only came on the scene after the floor was fully loaded, we do not see how they can possibly be in a position to say whether or not the construction had perfectly recovered its original form. Of course, it may have done so, or, on the other hand, it may have acquired a small permanent set which would have to be added to the elastic deflection under load.

We do not for a moment wish to suggest that any permanent deformation really existed, or to cast any reflection on the trustworthy nature of this floor. Our only point is that in reports of structural tests there ought to be absolute exactitude, and no room for surmise as to what actually happened.

THE BUILDERS' FOREMEN'S ASSOCIATION.

THE fourteenth annual dinner of the Builders' Foremen's Association was held on Saturday last week in the King's Hall, Holborn Restaurant, Mr. J. W. Lorden (Messrs. W. H. Lorden & Son), Mayor of Wandsworth Borough Council, presiding, supported by Messrs. G. L. Crickmay, T. Faldo (Messrs. T. Faldo & Co.), F. Cornish (President of the Association), T. Reynolds (Secretary of the Association), G. Thomson, Miller Higgs, B. Carter, W. S. Shepherd, J. Garrett, and others, the company numbering over 250.

The loyal toasts having been proposed by the Chairman and honoured,

The Chairman proposed the toast of the evening, "The Builders' Foremen's Association." In the Quarterly Report of the Association it was stated:—"If the good ship 'contract' won't bring you home, don't trust too much to the raft 'extras.'" There was a good deal in that, though some of them thought that extras were the lifeboat. When they saw the list of tenders published lately, they realised that some builders had got very low down on those lists, and he did not think they ought to trust to the raft. The Association was formed with several objects, one of which was the granting of pensions. There was a good deal of talk at the present time as to old age pensions, and if the Government could provide them it would be a good thing, but rather than subscribe to old age pensions compulsorily he thought it was better to do so voluntarily. The funds of the Association had been called upon rather largely lately in the matter of the contingent fund and he might say that a good many builders were in sympathy with them there, for the state of trade was very bad, and there was a great difficulty in getting work that would pay. The Association also provided a death fund for the benefit of wives and children at a time when help was so generally needed. The Association had done wisely in providing those three funds, and he trusted that they would be well sustained, and that the society would add to its membership. The Association provided educational lectures and visits to important works in order that members might be kept up to date, and that was a very wise and proper thing to do, and for that reason, if for no other, the Association deserved the support of all the builders of London. A great deal was heard nowadays as to reinforced concrete, and no doubt that had a great future before it, and it was necessary for all builders' foremen to get a knowledge of that form of construction, for a good many warehouses, etc., were being, and would be, constructed in that material, and it might be well for the Association to arrange a visit to a building being erected in that material. The Association also endeavoured to provide social and friendly intercourse between the members. The foremen were busy men, and were, as a rule, a conscientious body of men, who were anxious to do their work thoroughly and to study the employers' interests. If they erred on the right side it was only natural that they should do so. The clerk of works, of course, had a duty to perform to his employers, but he often kept the job as long as he could, and did not bring it to a successful conclusion as soon as he might. It was because of the little ways of a good many clerks of works that builders got behind in their jobs. The foreman's business was to lead the men and not to drive them, and to get them to do their work in the best possible way. He thought there were few builders in the county of London who expected their foremen to scamp work, and it was in the interests of the trade to do as good work as they could at the price at which the work had been got. Architects did not wish for anything else, and they were astonished at the price at which work was being done, and they agreed, he thought, that satisfactory work could not be often done at the price. The Association was doing all it could to promote the intellectual and general capabilities of its members—arranging visits, lectures, and discussions on matters of interest to its members in the discharge of their duties, and in assisting members who were out of employment to get work. As to why there was so much unemployment, it was not an easy matter to decide altogether. There was some cause that needed attention if we were not to suffer from unemployment as we did. There was no doubt that for years we had been making workmen who were not satisfactory tradesmen. They were not clever tradesmen, or men who could produce work at a reasonable or proper figure, and they dropped into the ranks of the unemployed. During the last ten or twenty years the number of these unsatisfactory tradesmen had been increasing, he thought. One reason for this used to be St. Monday, but they did not often have much trouble in that matter now. The reason why there were so many unsatisfactory tradesmen nowadays was that they were "slack," and were not properly trained. Parents were too anxious to have their boys earning money, and boys who were brought up to a certain standard by the public elementary schools were too apt to regard a trade as degrading, but a good workman who could produce good work was the happiest of men. Labour of every description should be elevating, for there was no degradation in labour. He had no happier times than when he was at the bench. It was in the hands of the men of England to alter the present state of affairs, and to have their children educated so that they should look upon labour as ennobling. More thorough workmen were required. He hoped that the Association would increase in membership. They need not make it a trade union, but they could meet together in order to consider the interests of the trade generally. Foremen should be something between the masters and the men, who had a perfect right to form themselves into combinations. Foremen ought to act between masters and men, and should not give way to the unreasonable master or the unreasonable union. He might say that a trade union recently wrote to him to complain that his plumbers had only half an hour for dinner. He inquired into the matter and found that the men had asked to work the other half-hour rather than stand about in the cold, and the foreman had consented to the proposal. This did not appear to be a very wrong thing to do, and yet the trade union concerned tried very hard to get the men to return to the old practice.

Mr. F. Cornish, President of the Association, suitably responded, and on behalf of the members thanked the President for a donation of 25 guineas. He also made an earnest appeal for further help on behalf of the Association and its work. They had had to make grants during the past year to several unemployed members, and their funds had been depleted a good deal in consequence. All money given to the Association was wisely expended, and the expenses were kept very low. During the eight years that they had had the insurance or funeral benefit fund they had had to pay out only in five cases, and they had not yet touched the sick fund. The Association could guarantee good men when employers wanted them. The position of the builders' foreman in these days was very different from what it was fifteen years ago. Then he had but one master, *i.e.*, the builder; now he had a score—the subcontractors, who tried to take possession of the job and everything on it, and if one appealed to the architect or quantity surveyor one was told to refer to the specification. As to trade unionism, there was nothing of the kind in the Association, and the members were left to make the best terms they could with the employer; the only suggestion of trade unionism was in regard to the superannuation fund.

Mr. G. L. Crickmay then proposed the toast of "The Building Trades." He referred to the changed conditions under which the builders worked to-day compared with the years gone by, when there were no subcontractors. He was not sure that work was better carried out by having all these specialists than it was when the builder was responsible for all the work. They were bound to have subcontractors in some cases, but, in his opinion, the less they took out of the hands of the builder to put into the hands of the subcontractors so much the better for the job, for, as a rule, the work was better done. Take joinery, for instance: there was nothing he liked better than for the general contractor to carry out the joinery work. Master builders had a great deal of capital invested in building undertakings, and they employed a large amount of labour. He agreed with the Chairman's remarks about unskilled labour, and he thought there ought

not to be so much of it. More boys should be set to study a trade, and to know it well—in fact, they should be apprenticed. He was a great believer in the old apprenticeship system, for he believed that when a boy had been apprenticed four or five years to a trade he learnt more than by the present method, and the old system made a lad an independent man, who, if he went in or out of the country, was always able to earn his living. A man ought not to drift into the ranks of unskilled labour, for that in the end meant unemployment. A builder had to be full of resource, and methodical, and exact; he had to be just, and he must get his men to think a great deal of him so as to get work carried out well, and, above all, the foreman must have great confidence in him and so must the workmen. A great deal was to be done by associations like the foremen's, and by meetings of men engaged in the trade. The more an architect knew the builder, the foreman, and the workmen, the better the work was done. Although a man did not make much money at his work, if he took pride in it he was helped along. The only way to get good work was for every detail to be considered, and for such work to be done by people who enjoyed doing it. It was also necessary to study the latest methods of building, and to keep abreast of the times.

Mr. J. Garrett, whose name was coupled with the toast, replied, remarking that a builder was an assimilator of all the trades.

Mr. T. Faldo then suitably proposed the toast of "The Visitors," and made a strong appeal on behalf of the Association. He proposed that each of the visitors present should get a foreman to join the Association, or should subscribe the amount of a member's subscription to the funds, *i.e.*, 2s. 3d. per month, to be raised to 3s. 3d. The cost would be under 2*l.* per year, and in that way the 1,000*l.* the Association wanted for the pension fund would soon be obtained. With the toast he coupled the name of Mr. W. S. Shepherd.

Mr. Shepherd having replied,

Mr. B. Carter proposed "The Chairman" in an able speech, and made an appeal on behalf of the Association.

The Chairman, who was received with musical honours, replied, and the proceedings shortly after terminated.

General Building News.

CAMBRIDGE UNIVERSITY.—The Sites Syndicate have chosen for the new buildings of the School of Agriculture a site on the Downing College area, situated at an intervening distance of 70 ft. to the south of the Botanical Laboratory, and covering a space of about 40 ft. by 120 ft. in extent; the cost of the building is estimated at some 20,000*l.* The Syndicate have conferred with Sir Aston Webb, R.A., in the matter of laying out the Downing grounds, and are of opinion that the buildings on that site should be committed to one architect.

NEW SCHOOLS, ABERFAN, MERTHYR TYDFIL.—These schools have been erected on a site adjoining the old Hafod Tanglwys-lane and Rhymney Railway, at Aberfan, and are arranged in two separate blocks facing a new road. The infants' school contains four classrooms accommodating fifty children, each with wide marching corridor and cloakrooms and lavatories attached. In the basement is a covered playground, with coals, boiler-house, and wood store. The girls' school is arranged for teaching purposes on the central-hall principle, with seven classrooms accommodating fifty girls each grouped around the hall, and with openings therefrom or from corridor leading off the hall. There are two entrances, one at the north and the other at the south end, with cloakroom and lavatory conveniently adjoining each entrance, and at the north end is the head mistress's room, with large book store attached. All the rooms are ventilated by means of hopper inlets and ceiling exhausts, the heating being carried out by means of patent warm-air ventilating grates. Externally the buildings are designed in rock-faced local Pennant stone and red brick dressing around the windows. Advantage has been of the nature of the site to provide in the basement large cookery-room, covered playground, boiler-house, and coals and wood store. The whole of the works, which have cost about 7,500*l.*, have been carried out by Messrs. Jones Bros., builders, etc., Edwardsville, Treharris, from the designs and under the supervision of the education authority's architect, Mr. J. Llewellin Smith, of Aberdare and Merthyr Tydfil, Mr. E. J. Evans, of Troedyrhiw, acting as clerk of works.

COUNCIL SCHOOL, SNEINTON.—The Nottingham Education Committee have opened a new school at Sneinton. It is a two-storied building, providing for the reception of 600 children, and comprising a large hall on the ground floor with five classrooms each capable of accommodating sixty scholars. A similar number have been constructed on the first floor, together with apartments for the teachers and a caretaker, and a large playground laid out. The contractors' undertaking also included the addition of two rooms to the infants' school close by, increasing its total accommodation to 420, the cost of the whole block being covered by an estimated sum of about 13,250*l.* The plans were prepared by the City Architect, Mr. F. B. Lewis.

CLAPHAM JUNCTION.—Concurrently with the alterations which they are making at their Victoria terminus, the London, Brighton, and South Coast Railway Company are about to effect extensive improvements at Clapham Junction, one of the chief features of which will be a spacious booking-hall on the level of the road bridge, with access to the platforms below, in place of the present inconvenient tunnels and ticket offices on the platforms.

PADDINGTON WORKHOUSE BUILDINGS.—The architect, Mr. F. J. Smith, has given a final certificate in respect of Messrs. Grimwood & & Sons' contract for the erection of the Paddington Workhouse extension blocks. The amount of the tender was 30,985*l.*, and the extras came to 879*l.* 12s. The architects, Messrs. Giles, Gough, & Trollope, have given a final certificate in respect of the contract of Messrs. Appleby & Sons for the erection of new workshops for the Paddington Guardians. The amount of the tender was 1,800*l.*, and the extras totalled 339*l.* 9s. 3d.

WORKMEN'S LIBRARY, PONTLOTTYN.—A workmen's library and institute has been built at Pontlottyn. The building, which has been constructed and furnished at a cost of over 2,000*l.*, was erected by Mr. Theo. Matthews, Pengam, to plans by Mr. P. Vivian Jones, Mr. Robert Davies being clerk of the works.

CARDIFF CITY HALL AND LAW COURTS.—A report from the Cardiff City Engineer to the Town Hall Sub-Committee relative to defects in the fittings and furniture and the structure generally internally and as to the roofs of the City Hall and Law Courts was laid recently before the City Council, but was deferred for future consideration. The City Engineer reported that the defects were so numerous that he had been unable to find time to tabulate them. The furniture and fittings showed shrinkages, and there were splits in tables and desks, and, in many cases, the electric lights were not in the right position. The defects in the structure were chiefly in warpings and shrinkages of doors and framings, defective door and window fastenings, cracks in pavings and ceilings, etc. He (the City Engineer) was of the opinion that the defects were due to the extreme dryness and warmth of the air in the rooms. There were complaints from the stipendiary as to the low temperature of his room, and there were numerous complaints as to the ventilation from all departments of the City Hall. These complaints had been forwarded to the architects, and they had replied that they would be properly attended to, and in the meantime the City Engineer had supplied a supplementary report containing a list of 382 items of structural defects in the main buildings, furniture, and fittings.—*Western Mail.*

HOSPITAL ADDITIONS, LIVERPOOL.—The Stanley Hospital has been enlarged by the addition of a new ward for gynæcological cases and new kitchens. The improvement scheme also includes an installation of two steam boilers, a thorough modernisation of the entire hot and cold water system, a reconstruction of the drainage scheme, and the provision of increased housing accommodation for the staff. The cost of the improvements has been about 9,000*l.*, and Mr. F. B. Hobbs was the architect.

BUILDING AT ASHTON-UNDER-LYNE AND DROYLSDEN.—The building trade in Ashton-under-Lyne has not been brisk during the last year. There have been, however, several big jobs completed and brought into use. The new station extensions on the Great Central Railway at Guideбridge, the Waterside Mill Company, Ltd., and the National Gas Engine Company's extensions were among the most important of them. Messrs. E. Marshall & Sons, Ltd., builders, have also finished their extensive workshops and offices in Rutland-street, and they are in full use. In Droylsden the past year has been one of progress, and not for many years past has the building trade been so brisk as of late, and indications point to continued prosperity for many months to come. During the present year many schemes of a public character will be placed in hand.

PARISH BUILDING, STOKE.—Premises have been erected in connexion with St. Barnabas Church, Stoke, to accommodate the Sunday school and for other parochial purposes. The plans were prepared by Mr. Charles Cleverton, and Messrs. Pearn Brothers, of Plymouth, were the builders, the cost being 2,300*l.*

Stained Glass & Decoration.

S. CHAD'S CHURCH, BENSHAM, GATESHEAD-ON-TYNE.—Messrs. Percy Bacon & Brothers have just executed and erected in this church a five-light stained-glass memorial window to the late Bishop of Newcastle. There are two tiers of figures running through the five lights, the central figure in the upper tier being Our Lord as Priest and King, flanked on the right and left by Melchizedek, S. Peter, S. John, Aaron, while in the lower tier appear S. Nicholas in the centre, with Sigebert, Felix, Aiden, Oswald on the right and left. On shields are introduced the arms of the late Bishop, those of City of Newcastle, Bishop of Thetford, S. Edmund's Hall, Oxford, and the Lloyd family. In the tracery there are angels holding shields and scrolls. The inscription contained the following words:—"To the glory of God, and in memory of Arthur Thomas, Lord Bishop of Newcastle, who fell asleep, May 29, 1907, in the 63rd year of his age. This window is dedicated by his friend, Emily M. Easton, on the Festival of the Epiphany, 1908" (which was the date of the unveiling).

Sanitary and Engineering News.

FRASERBURGH WATER SUPPLY.—Mr. W. Allan Carter, M.Inst.C.E., Edinburgh, has prepared, at the request of the Fraserburgh Town Council, a report on the proposed sources of additional water supply for the burgh. Mr. Carter discusses various schemes proposed, and decides in favour of what is known as the Fedderate scheme, which goes for its source to the Water of Fedderate, at a point about two and a half miles south of New Pitsligo.

WARRINGTON WATERWORKS.—The award in the Warrington Waterworks arbitration has just been published. In 1900 the Corporation let the contract for extensions for 24,000*l.* to Mr. George Lawson, of Rutherglen, Lanark. Provisions were made, says the *Manchester Guardian*, for extra pumping, if necessary, to keep the workings safe, and under these provisions the contractor charged extras and exceeded time. When the work was completed he had received from the Corporation 35,400*l.*, and he sent in a bill for a further balance. This was resisted, and the contractor issued a writ. The Corporation took proceedings to have the claim arbitrated upon under the terms of the contract. This was granted, and Mr. George Henry Hill, Albert-square, Manchester, and Westminster, was appointed arbitrator. His award is that the contractor is indebted to the Corporation to the extent of 1,400*l.*, but he does not say whether this is in respect of overpayment or is due on the counter-claim made for 8,000*l.* for delay in carrying out the work. The contractor has to pay the costs of the arbitration, and the Corporation the costs of the action leading to arbitration.

LOUGHBOROUGH SEWAGE WORKS.—At the Loughborough Town Hall, on the 10th inst., Mr. W. A. Ducat, Local Government Board Inspector, held an inquiry relative to the application of the Loughborough Corporation to borrow 1,600*l.* for the provision of a refuse destructor and overhead railway at the Sewage Disposal Works. The Town Clerk stated that tenders had been received from various makers, but the Committee had entered into a provisional contract with Messrs. Manlove, Alliott, & Co. to put down a destructor similar to the existing one. The destructor was to be of a capacity to deal with 20 tons of refuse per day, and the cost of the works was 1,382*l.*, less an allowance of 20*l.* for the old material. It was also proposed to provide a new clinker railway, and the Committee had decided to provisionally accept the tender of Mr. J. T. Godfrey for 147*l.* The Borough Surveyor bore out the Town Clerk's statement, and produced plans of the destructor and railway.

WATER SUPPLY TO FIRST GARDEN CITY.—Four years ago the company had an artesian tube well, 14½ in. diameter, sunk to the depth of 210 ft. Water was reached at the depth of about 90 ft. below the surface and an abundant supply was obtained of great purity. Deeming it advisable to provide entirely duplicate plant comprising another well, deep well-pumping machinery, and engine, the work of boring the second well was placed in the hands of Messrs. Le Grand & Sutcliff, who had made the first one. The chalk at the pumping-station is met within a few feet of the surface, and is known as the lower division of the middle chalk formation, the boring just reaching the Melbourn rock. The water level was found to stand at about 100 ft. below the surface. A pumping trial extending continuously for seventy-two hours raised 400,000 gallons of water, during which time the waterworks plant was also kept going continuously. In a very

few minutes after pumping ceased it was found that the water had recovered its level, and rose 18 in. higher by the following morning. It is therefore beyond doubt that the site chosen for the waterworks is an excellent one, capable of providing amply for future requirements.

Foreign.

FRANCE.—M. Olivier Merson has been elected President of the Académie des Beaux-Arts for the present year, and M. Nénot Vice-President. M. Nénot has also been elected President of the Société des Artistes Français (Old Salon), and M. Daumet President of the Architectural Section.——A new semaphore is to be constructed at Havre, between Frascati's and the small inner jetty, at a cost of 100,000 francs. M. Jacquey is the engineer.——The twenty-first exhibition of the Fine-Art Society of Lyons will be opened on February 20, under the Presidency of M. Nénot.——The Jury in the competition opened by the Municipality of Voiron (Isère) for a hospital, have awarded the first premium to M. Perrin, of Grenoble.——The Municipal Council of Marseilles have decided to devote a sum of near .7 million francs to various architectural works; among them the installation of a Faculté de Droit in the old Hotel of the Banque de France, and the building of a Conservatoire of music in the Cour Pierre Puget; the erection of a new Salle des Fêtes; a building for the Faculté de Science; and a fire-brigade barrack.——M. Hébrard has been appointed architect to carry out a new Lycée at Nice, at a cost of 3 million francs, apart from the cost of the site.——The Municipality of Mentone intend to devote a sum of 2 million francs to the enlargement of the Hospice there, which will be transformed into a Mixed Hospital.——The death is announced, at the age of 64, of M. Fanost, architect.——The death is announced also of M. Eugène Vidal, painter, a pupil of Gérôme. He made his *début* at the Salon in 1873. Among his principal works may be mentioned the portrait of Archbishop Lavigerie, in the Salon of 1876, and the "Jeune Fille en Corset Rose" in the Luxembourg Gallery. He was a member of the Société Nationale des Beaux-Arts (New Salon).——The death is also announced of M. Henri Fernoux, Architecte-Expert to the Civil Tribunal of the Seine, Honorary President of the Société Nationale des Architectes de France, etc. Among his numerous works, during a long professional career, may be mentioned the theatre at Belleville, the restoration of the Théâtre de l'Ambigu, and a large number of buildings for business purposes in Paris.

GERMANY.—Out of seventy-eight designs submitted in the competition for a church, vicarage, and parish hall for St. Barbara's parish, Breslau, the first premium was unanimously awarded to the Surveyor Kickton, of Berlin; the second to Messrs. Jürgensen & Bachmann, of Charlottenburg.

AUSTRIA.—Thirty designs were sent in for the competition for a museum for Innsbruck. The first premium of 3,000 kronen was awarded to Professor Gabriel Seidl, of Munich; the second to Herr L. Bauer, of Vienna; and the third to Herr Heinrich Ried, of Vienna.——The Society of Austrian Engineers and Architects have forwarded a petition to the Municipality of Vienna begging it to abstain from erecting the proposed museum in the Karlsplatz. While recognising the merits of Herr Otto Wagner's design, the Society points out that a more suitable site should be chosen, where the building would not overpower an important ancient monument like the Karlskirche.

ITALY.—While the Italian Government, as represented by the Board of Education, has become the centre of the research movement, and has founded the *Bullettino del l'Arte*, and subscribed 5,000,000 francs towards the work during the past year, and while the *Associazione Romana di Archeologia* was started to instruct the public on the spot about their ancient city, yet another body, the *Società Italiana di Archeologia e di Storia dell'Arte* was founded in 1906 by leading professors of the universities and directors of public museums. The object of this last-named society is to publish for the benefit of the public any discoveries made by its members in archæology or history of art, and at the same time to notify any researches on those subjects made at the instigation of the State. The numbers of the society's organ, the *Ausonia*, published in 1906-7, includes articles by the late Professor E. Brizio on "The Youth of Subiaco" and "The Niobe of Chiaramonti"; by Ciaccio on "The Last Phase of Gothic in Rome"; by Lanciani on "Unpublished Memoirs of Artists of the XVIth Century"; by Ch. Hülsen on "The Inscription of the Prætorian Præfect Furius Victorinus"; by G. Zippel on "The History of the Palazzo Venezia, Rome," etc.

RUSSIA.—In an article on the production of petroleum in 1906, Dr. Kissling points out how the output of America is increasing, while that of Russia is decreasing. In 1903 America supplied 49·5 per cent. of the world's consumption to Russia's 40 per cent. In 1905 America supplied 63·2 per cent. to Russia's 24·2 per cent.

HOLLAND.—Recent observations and calculations show that from 1871-1906 the water level in the Netherlands has risen 4·5 cm., which indicates a sinking of the ground in relation to the average sea level of about 13 cm. in a century.

SWEDEN.—The men working in the Swedish quarries have demanded a rise in wages, and consequently Swedish paving-stones have gone up in price. The stonemason now earns 50 pfennig per hour, a rise of about 10 per cent. on his former wage.

SWITZERLAND.—A new church and vicarage are shortly to be built in Oberstrass-Zurich from the plans of Messrs. Pfleghard & Hœfli, of Zurich. The church is to seat about 1,080, and the total cost of the building is estimated at 588,000 francs.——The members of the Confederation have approved of the immediate construction of the second Simplon Tunnel, as proposed by the General-Directorship of the Swiss Railways.

QUEEN VICTORIA MEMORIAL HALL, CALCUTTA.—As the result of an examination by a committee of experts of the concrete foundations on the Maidan, in which subsidences became manifest, the memorial trustees have resolved to adopt that site for the erection of the All India Victoria Memorial, after Sir William Emerson's plans. The committee are of opinion that the inequalities of settlement and the overstrains which have dislocated the foundations are due, in part, to differences in the nature of the substrata, combined with their liability to seismic disturbance, which present difficulties to the use of continuous concrete footings. The memorial trustees have therefore decided to spread out the foundations into expanded sections which will severally take their own independent bearings, and will have enough freedom of readjustment without dislocation in the event of unequal settlements; they have also decided that a reduction shall be made of the height of the general design of the superstructure.

JAPAN.—Japan is very rich in water power, the amount being estimated at 1,000,000 h.p. More than 100 small water-power stations are in operation, and several large ones are in course of construction. Amongst the latter may be mentioned that of Kioto, where 4,400 h.p. will be produced. The Japanese are also constructing several water-power stations in Corea.

Miscellaneous.

PROFESSIONAL AND BUSINESS ANNOUNCEMENTS.—The partnership between Mr. R. St. A. Roumieu and Mr. A. Aitchison (practising as architects under the style of "Roumieu & Aitchison" at 10, Lancaster-place, Strand) has been dissolved by mutual consent; the practice will be carried on by Mr. Roumieu at the same address and under the same style as before.——Messrs. Fenlon & Son, heating specialists, etc., of 8, Tudor-street, E.C., have taken over and incorporated with their own the business of Messrs. G. Shrewsbury & Co., late of 17, South-street, Finsbury.

THE ROYAL SANITARY INSTITUTE CONGRESS.—The Earl of Plymouth, who is Lord-Lieutenant of Glamorganshire, has consented to act as President of the twenty-fourth annual Congress and Exhibition of the Royal Sanitary Institute, to be held at Cardiff from July 13 to 22, 1908. The public meeting to inaugurate arrangements for the Congress will be held at the City Hall, Cardiff, on Thursday, February 6. The Lord Mayor will take the chair at 3.30 p.m.

TOWN PLANNING.—The Incorporated Association of Municipal and County Engineers has forwarded to the Local Government Board a memorial in favour of additional powers being conferred on local authorities to enable such authorities to regulate and control the planning and extension of towns. The Association is asking borough and town councils, etc., to support the memorial.

THE LABOUR MARKET IN THE COLONIES.—The January circular of the Emigrants' Information Office, 31, Broadway, Westminster, states that in *Canada* a new regulation provides that all emigrants landing until February 15, 1908, must possess 50 dollars at the time of landing, and all arriving between February 15 and April 1, 1908, must possess 25 dollars. They must, in addition, in every case have money for their inland railway fares; unless they can satisfy the emigration officers at the time of landing that they are going to already assured employment immediately on arrival, or will be cared for by friends. The demand for labour is over for the season. In parts of the eastern provinces the supply of labour is now more than sufficient, owing to the thousands of persons who emigrated to Canada last summer from Great Britain and the Continent, and to the recent arrival of large numbers of out-of-work mechanics and labourers from the United States in search of employment. No one, therefore, should go to Canada in search of work during the winter. Persons wishing to go there should wait till April, but even then they should not start—especially those with young families—unless they go to take up engagements or have enough money to live on till they find employment. The most important event which occurred last quarter affecting emigration to *Australia* was the increased assistance given to emigrants by *Queensland*. Not only have the rates for nominated passages been reduced, and assisted passages at 5*l.* a head continued for those with a little capital, but free passages are now given to agricultural labourers where the prospective employer pays 5*l.*, and to the wives and children of all the above emigrants, and to female domestic servants. *New South Wales* continues to grant assisted passages at 6*l.* to 8*l.* to persons skilled in rural pursuits, and to female servants at 3*l.* to 6*l.*; hundreds of such persons have already gone out on these terms. *Western Australia* continues to grant cheap assisted and nominated passages to approved emigrants, besides free farms of 160 acres. The chief demand throughout Australia is for men who can work on the land. In New South Wales there is a demand for hard-ground miners, but not in the other States. In no part of Australia is there any pressing demand for mechanics, unless they are specially skilled; the best chances are for carpenters, masons, blacksmiths, and plasterers. In *New Zealand* the local supply of mechanics is about equal to the demand, but skilled men would not have much difficulty in procuring work if they could keep themselves while searching for it. *South Africa* should be avoided by emigrants at the present time. In *Cape Colony* the supply of labour largely exceeds the demand, and mechanics of practically every trade experience extreme difficulty in obtaining employment. In *Natal* the supply of white labour considerably exceeds the demand. No one should go to the *Transvaal* now in search of work. Large numbers of men, especially carpenters, masons, bricklayers, and plasterers, have left the Transvaal through inability to obtain work there.

"WILLING'S PRESS GUIDE."—The 1908 edition of this well-known guide to the Press of the United Kingdom is the thirty-fifth annual issue of one of the best guides of its kind, which contains also a list of the principal colonial and foreign journals. It is one of the handiest and most reliable works of its kind, and it is published at the low price of 1s. by James Willing, Jun., Ltd., 125, Strand, W.C.

NATIONAL FEDERATION OF BUILDERS.—The annual meeting of the Midland centre of the National Federation of Building Trade Employers of Great Britain and Ireland was held at the Acorn Hotel, Birmingham, on Monday last. The President (County Councillor John Dallow, Blackheath) presided. The annual report stated that the building trade in the centre continued to be in a very depressed condition, and, with competition keener than ever, the outlook at the beginning of the year was by no means cheering. There had been no serious labour disputes in the trade within the area of the centre during the year. The difficulty with several of the branches at Coventry in the spring had been settled by an arbitrator appointed by the Board of Trade. One new Association (King's Norton and Northfield) had been affiliated to the centre during the year. The amount promised towards the national reserve fund was 980*l.* 19s. 6d. After the payment of a first instalment of 400*l.* to the National Federation, the cash in hand was 298*l.* 18s. 7d. The second annual meeting of the Midland Centre Conciliation Board was held at Nottingham on May 15 last, when it was reported that local boards had been formed at Birmingham, Burton-on-Trent, Derby, Leicester, Newark, Nottingham, North Staffordshire, Walsall, West Bromwich, and Wolverhampton. A conference of Midland Centre Secretaries was held in Birmingham on March 14 last with results that justified a repetition of the experiment. The collective insurance scheme with the Law, Car, and General Insurance Corporation (for the insurance of members against workmen's compensation risks) had been well taken up by a number of associations. The retiring President was heartily thanked for the services he had rendered during the year. The officers for 1908 were elected as follows:—President, Mr. W. Wistance (Walsall); Vice-Presidents, Councillor H. Smith (West Bromwich) and Lieutenant-Colonel J. Barnsley (Birmingham);

Auditors, Mr. Albert S. Smith (Birmingham) and Alderman T. Lowe (Burton-on-Trent); Treasurer, Mr. H. Willcock (Wolverhampton).

A NEW ROOFING TILE.—Mr. John Crump, of Bridgnorth, sends us samples of a new tile which he calls the "Durus" tile. He states the nature and object of his tile as follows:—Roofs covered either with tiles or slates remain saturated with wet for days after the rain has ceased, and the flat surfaces of the tiles or slates, coming together, hold the water between them by capillary attraction, and when frost supervenes the saturated tiles become disintegrated or laminated. Mr. Crump claims that the "Durus" tile will remedy this defect; by being fluted on the under side, it will prevent the water from being held by capillary attraction, and thus the rain falling upon the roof will pass off quickly and soon become dry. It seems a reasonable idea, and is at all events worth the attention of architects and builders.

THE ART-UNION OF LONDON.—The Art-Union send us a print of the large etching of "Royal Windsor," an etching by Mr. C. O. Murray after a painting by Mr. Niels M. Lund. It is a fine composition, and a very highly finished reproduction, though it is what we call engraving on copper rather than etching in the true artistic sense of the word. The Art-Union still seem to think that *size* is a necessary element in the value of the work they issue to subscribers; a bad lesson to the public.

GLASGOW ECCLESIOLOGICAL SOCIETY.—This Society met on Saturday last in the United Free College, when a paper was read by Mr. A. L. M'Gibbon on a Saxon church, Bradford-on-Avon. The church was built by Aldhelm, Abbot of Malmesbury, probably towards the close of the VIIth century, and presents all features of Saxon architecture. For many years it was in a neglected condition, the nave being used as a charity school and the chancel entirely built up. Houses were built against the walls, so that only the western portion of the church was visible. The church has been restored for some time, and now presents one of the most perfect examples of this earliest style of architecture. The exterior is ornamented with shallow arcading of unusual character, being only incised on the surface of the stone, and having no constructional value. The building is probably the small original church of the Abbey founded by Aldhelm as an offshoot from Malmesbury for missionary purposes in an adjoining district.

LEEDS UNIVERSITY AND ARCHITECTURAL STUDY.—In connexion with the Leeds University Extension work a course of four lectures on the "Development of Mediæval Architecture in England" has been arranged for four Thursday afternoons in February beginning on the 6th of that month. The lectures will be given by Mr. John Bilson, F.S.A., in the Philosophical Hall, and his remarks will, of course, be illustrated by lantern slides and models.

OXFORD UNIVERSITY.—Mr. Charles John Holmes, hon. M.A., Brasenose College, has been elected for a further term of three years as Slade Professor of Fine Art.

A MEMORIAL TO NAPOLEON.—Signor Sindoni, of Rome, has completed a statue, heroic size, of Napoleon standing in the traditionary attitude for the monument with which the residents of Elba will commemorate the centenary of the Emperor's sojourn in that island.

SIR HENRY IRVING MEMORIAL.—The Westminster City Council have granted to the memorial committee, of which Sir John Hare is president, a site for the proposed statue to be sculptured by Mr. Thomas Brock, R.A. The memorial will be erected on the middle point of the wide pavement along the north front of the National Portrait Gallery, which there faces Charing Cross-road.

"ARTISTIC CALENDARS."—Under this heading we should have noticed, had we seen it, a calendar sent out by Messrs. Arthur L. Gibson & Co. (folding gate, etc., manufacturers), decorated with a very good chromolithograph reproduction of a scene "In Old Kentucky" by an American artist, Mr. Lamasure. By some oversight this calendar did not come under the Editor's notice, or we should certainly have included it among those mentioned in our former paragraph.

REFIXING SASH-CORDS.—Mr. G. Catheart Smith, of Clapham, sends us a model showing an ingenious arrangement for fixing new sash-cords on sash-windows without the trouble of removing the beading. The lower end of the cord is held in a metal holder which fits into the groove for the cord, and is flush with the lower surface of the sash rail. A small pocket-piece is made to take out for getting at the weight and detaching the cord from it; the metal holder at the other end can then be drawn out with a button-hook or any other such implement (there is a hole at the base of it for hooking into), the new cord attached to the holder pushed in over the pulley, and attached to the weight, when the pocket-piece is replaced. It is certainly an easier method than taking the beads off.

MANCHESTER BUILDING TRADES EXHIBITION.—This exhibition will be opened by the Lord Mayor of Manchester on March 3. Enquiries as to exhibits may be addressed to the General Manager, Mr. Walter Cawood, St. James's Hall, Manchester.

READING SCHOOL.—At a meeting of the Reading Education Committee held last week it was decided that Messrs. Charles Smith & Son, Messrs. Ravenscroft, Son, & Morris, Mr. G. Webb, and Mr. W. R. Howell, architects, all of Reading, be invited to prepare and submit to the Education Authority sketch plans dealing with the alterations and additions to the premises of Reading School outlined in the report of the Board of Education; that there be paid to each of the four parties abovementioned the sum of 30 guineas for the preparation of such plans, the plans so prepared to become in each case the absolute property of the Reading Education Authority; and that the final appointment of architect be deferred until the plans shall have been considered by the Education Committee.

ORIENTAL ART AT THE BETHNAL GREEN MUSEUM.—Lord Curzon has lent for exhibition his very interesting and valuable collection of objects of Eastern art and memorials of the Delhi Coronation Durbar, with presentation caskets wrought in ivory, silver, and wood. Many exemplars were from Persia, Peking, Burma, Siam, and the Shan States on the Chinese border; there are beautiful specimens of Baroda workmanship, with bronzes, enamels on gold, wood and ivory carvings, and jewellery from the remoter northern States of India, together with sacred images, temple lamps and furniture, and household utensils from Nepaul and Sikkim and Thibet, and figures of Buddha presented by the Lamas at Lhasa and Shigatse to the ex-Viceroy.

CARDIFF (OLD) TOWN HALL.—At the recent proposed sale by auction Mr. Douglas Young, acting for the Corporation in conjunction with Messrs. J. J. David & Co., of Cardiff, withdrew the property at a buying-in bid of 65,000*l*. The premises cover a freehold site of 4,000 sq. yds., having frontages to Westgate and St. Mary streets, and to a new projected thoroughfare; they comprise the old town hall, post-office, and other buildings. The freehold site of 4,500 sq. yds. in Cathedral-road was sold at a bid of 1,860*l*.

Legal.

SOUTHWARK PARTY-WALL DISPUTE.

THE case of Walsh *v.* the Mayor, etc., of Southwark (Higgs) came before Mr. Justice Sutton and a common jury in the King's Bench Division on the 13th and 14th inst.—an action by the plaintiff, Mr. Thos. Walsh, a bootmaker, against the defendants for damages for alleged nuisance and trespass.

Mr. Clavell Salter, K.C., and Mr. Cecil Walsh appeared for the plaintiff; Mr. Manisty, K.C., and Mr. Frank Dodd for the Corporation; and Mr. Scott appeared for Messrs. Higgs & Co., the builders.

In this case the plaintiff alleged that between his shop and the adjoining premises there was a party wall, and that after July, 1906, the defendants erected a large shore in front of his premises. In January, 1907, defendants gave notice of their intention to build under the London Building Act, and they subsequently erected a large shore in the passage and doorway of plaintiff's premises, putting a pin through the party wall and damaging a bedroom. Plaintiff alleged that through these acts he had sustained loss, and he accordingly brought the present action for damages.

Defendants, by their defence, denied that the wall was a party wall. They admitted putting up the shores, the first they said being erected by direction of the District Surveyor acting under the provisions of the London Building Act. Defendants pleaded that this was necessary, otherwise the plaintiff's premises would have been a dangerous structure, and that as defendants were the local authority to deal with dangerous structures, the shore was essential. With regard to the second shore the defendants said it was erected by the contractors with the consent of the plaintiff, and their contractors had always been ready and willing to replace the shore by a brick pier if the plaintiff would consent. Defendants denied that the pin was put through the wall as alleged, and alternatively they claimed an indemnity against their contractors.

The plaintiff, in reply, said that if the wall in question was a party wall the work carried out was illegal, and the defendants could not therefore say it was not a party wall. Plaintiff further said that the defendants were not the proper authority to deal with dangerous structures, and that his premises would not have been dangerous if it had not been for the acts of the defendants themselves.

After hearing the evidence and the addresses of counsel, the jury returned a verdict in favour of the plaintiff for 50*l*. damages.

It was arranged that the legal arguments on the form of the judgment to be entered should be heard on the 17th inst.

Patents of the Week.

APPLICATIONS PUBLISHED.*

28,892 of 1906.—M. ALTMAN: *Manufacture of Metal Pipes.*

This relates to a machine, for the manufacture of metal pipes by fusing the edges of bent-up blanks, similar to a drawbench, characterised by a device for the reception of the blowpipe or blowpipes, in front of which the edges of the blanks are brought for the purpose of fusing them.

262 of 1907.—W. L. CLARK: *Appliances for Disinfecting the Air of Closets, Residences, Hospital Wards, and the like.*

This relates to appliances for disinfecting the air of closets, residences, hospital wards, and the like, automatically or otherwise, in which for the purpose of carrying out the invention a cylinder air-pump is used fitted with an internal spiral spring operating on the piston-rod. On this pump is a nozzle outlet to which is fixed a tubing which is connected to a spraying tube fitted in a reservoir containing disinfectants, perfumes, or the like for spraying; in some cases the air-pump may be fixed a little way from the reservoir, and sometimes inside the reservoir for convenience. This is carried out by attaching a pull chain to the piston-rod of pump, or by connecting this to the ordinary water flush-chain, or to the door, seat, or lid of water-closet. In front of the spraying tube is fixed a small sponge or absorbent pad attached to a suitable frame to catch the spray of perfume or disinfectant.

654 of 1907.—J. SEPHTON: *Domestic and like Firegrates.*

This relates to a firegrate closed permanently at the front above the grate bottom by a permanent plate, and having connected with it below said bottom an ash space flap door suspended by its upper edge from a ledge and capable of being moved at its lower edge so as to completely close said space or allow air to pass in at the bottom more or less.

980 of 1907.—W. BETTIS: *Chimney and Ventilating Shaft Tops.*

This relates to a fan for a chimney or ventilating shaft wherein the blades are provided with downwardly extending wings formed more or less at right angles to the blades, and having turned portions at their ends, and wherein the fan is adapted to rotate on ball bearings, and is provided with means for preventing lateral motion of the fan spindle.

3,078 of 1907.—C. G. NOBBS and C. G. NOBBS, JUN.: *Electric Steam Radiator for Heating Buildings or the like.*

This relates to an electric steam radiator for heating buildings or the like in which the vertical loops for the circulation of the steam are connected in the usual manner by upper and lower horizontal connecting members, and wherein the steam is generated by means of an electric heating element or elements immersed partially or completely in a small quantity of water contained in the lower horizontal members, and to the combination therewith of another electric heating element adapted to superheat the steam generated by the other electric heating element.

3,387 of 1907.—W. A. MITCHISON: *Windows having Sliding Sashes.*

This relates to sliding sash windows wherein the sash guides are provided with loose or swinging portions for rotating or swinging the sashes, and consists in providing the stiles of the upper and lower sashes with central pins or the like, adapted to project into, and work in, grooves or slots in the guides and in the end frames, and to be connected to the cords of the balance weights, and also in arranging the loose or swinging portions of the guides to rotate or swing on the pins or the like of the lower sash, or on suitable hinges, the arrangement being such that, when the sashes are swung in said loose or swinging portions on the pins or the like, the sashes are retained in line with the cord pulleys so that the cords are not displaced.

* All these applications are in the stage in which opposition to the grant of patents upon them can be made.

PATENTS—*Continued on page 81*

List of Competitions, Contracts, etc.

For some Contracts still open, but not included in this List, see previous issues. Those with an asterisk (*) are advertised in this Number: Competitions, iv.; Contracts, iv. vi. viii. x.; Public Appointments, xix.; Auction Sales, xxviii.

Certain conditions, beyond those given in the following information, are imposed in some cases, such as: the advertisers do not bind themselves to accept the lowest or any tender; that a fair wages clause shall be observed; that no allowance will be made for tenders; and that deposits are returned on receipt of a bonâ-fide tender unless stated to the contrary.

The date given at the commencement of each paragraph is the latest date when the tender, or the names of those willing to submit tenders, may be sent in.

***** It must be understood that the following paragraphs are printed as news, and not as advertisements: and that while every endeavour is made to ensure accuracy, we cannot be responsible for errors that *may* occur.**

Competitions.

JANUARY 31.—**Pontypridd.**—OFFICES.—Pontypridd Guardians invite competitive designs for the erection of Administrative Offices in Court House-street, Pontypridd. Intending competitors may, on payment of a fee of 2*l.* 2s., obtain all information with reference to the Guardians' requirements from Mr. William Spickett, Clerk to the Guardians, Union Offices, Pontypridd.

NO DATE.—**Lowestoft.**—SCHOOL.—The Lowestoft Education Committee have decided to offer prizes of 60*l.*, 30*l.*, and 10*l.* for designs for a new Secondary School at Lowestoft. The competition will be limited to architects practising in East Suffolk. Conditions and particulars may be obtained on payment of 5s. from the Town Clerk, Mr. R. Beattie Nicholson, Town Hall, Lowestoft.

NO DATE.—**Manchester.**—COKE CUTTING AND SCREENING PLANT.—Schemes for the laying down of a coke cutting and screening plant, comprising cutting machinery, conveying plant, mechanical screens, hoppers, sidings, and turntables, etc. Intending competitors may, on payment of a fee of 2*l.* 2s. (1*l.* 1s. of which will be returned to bonâ-fide competitors), obtain all information from the engineer, Mr. Gilbert S. Heathcote, 196, Deansgate, Manchester.

Contracts.

BUILDING.

JANUARY 20.—**Lemington.**—CO-OPERATIVE STORES.—Tenders are invited for the erections of greengrocery shop, warehouse, hunger house, etc., at this branch of the Blaydon Co-operative Society. Plans, etc., may be seen at the grocery shop, Lemington.

JANUARY 20.—**Looe.**—RETORT HOUSE.—The erection of a retort house at the Looe Gasworks. Plans, etc., can be seen at Looe by arrangement with Mr. Lester Cook. Mr. John Sansom, F.R.I.B.A., Liskeard.

JANUARY 20.—**Monaghan.**—COTTAGES.—Monaghan R.D.C. invite tenders for the repairs of two labourers' cottages, one in Mullan and one in Lisleitrim. Specification can be seen on application to Clerk, Mr. Samuel Mitchell, Board-room, Workhouse, Monaghan.

JANUARY 21.—**Bradford.**—SHOP ALTERATIONS.—Bradford Corporation invite tenders for works of all trades required in alterations to shops, Nos. 63, 65, 67, and 69, Manchester-road. Drawings, etc., may be seen, and bills of quantities and form of tender obtained, on application to the City Architect, Whitaker-buildings, Brewery-street, Bradford.

JANUARY 21. — **Little Horton.** — CHAPEL. — The various works required in the erection of Wesleyan Reform School Chapel in Little Horton. For quantities apply to Messrs. Walker & Collinson, architects, Cheapside-chambers, Bradford.

JANUARY 21.—**York.**—CHAPEL, ETC.—The erection of a Wesleyan Chapel and classrooms at Clifton, York. Drawings, etc., at the offices of Mr. Edward Taylor, architect, 7, Stonegate, York.

JANUARY 22.—**Bootle.**—PAVILION.—The Corporation of Bootle invite tenders for the construction of a pavilion on bowling green at Derby Park. Plans, etc., may be seen, and bills of quantities obtained, at the office of the Borough Engineer.

JANUARY 22.—**Selly Oak.**—SCHOOLS.—King's Norton and Northfield U.D.C. Education Committee invite tenders for the work of building the first portion of a new Council school at Raddle Barn-lane, Selly Oak, near Birmingham. Names, together with a deposit of 3*l.* 3s., to Mr. J. P. Osborne, architect, 95, Colmore-row, Birmingham.

JANUARY 23.—**Halifax.**—HOUSES.—The various works required in building a pair of semi-detached houses in Linden-road. Plans, etc., may be seen, and bills of quantities obtained, at offices of Messrs. Jackson & Fox, architects, 7, Rawson-street, Halifax.

JANUARY 23.—**Pontypridd.**—VILLAS.—The erection of twenty-two villas near The Avenue, Pontypridd, for the Macintosh-road Building Club. Plans, etc., may be seen at office of Mr. Arthur Lloyd Thomas, A.M.Inst.M.E., architect and surveyor, Church-street-chambers, Pontypridd.

* JANUARY 23.—**Rhyl.**—ASSEMBLY ROOM.—The Rhyl U.D.C. invite tenders for erection of assembly room on foreshore at Rhyl. For further particulars see advertisement in this issue.

JANUARY 27.—**Bury.**—CHIMNEY SHAFT.—The Corporation of Bury invite tenders for the erection of a chimney shaft, 180 ft. high, at the intended Electricity Generating Station, Chamber Hall, Bury. Drawings may be seen, and specification, etc., obtained, upon application to Mr. Arthur W. Bradley, A.M.Inst.C.E., Borough Engineer and Surveyor, Bank-street, Bury, on payment of a deposit of 1*l.*

JANUARY 27.—**Hulme.**—TENEMENT HOUSES.—Manchester Sanitary Committee invite tenders for the erection of forty tenement dwellings, Barrack-street, Hulme. Drawings may be seen, and specification, etc., obtained, at the office of the City Architect, Town Hall, upon payment of 1*l.* 1s. All cheques or postal orders are to be made payable to the order of "The Corporation of Manchester."

JANUARY 27.—**West Hartlepool.**—ELECTRICAL SUBSTATION.—North-Eastern Railway Directors invite tenders for the erection of an electrical substation at West Hartlepool. Plans, etc., may be seen, and quantities, etc., obtained, upon application to Mr. William Bell, the Company's Architect at York.

* JANUARY 28.—**Croydon.**—SWIMMING BATH.—The Croydon B.C. invite tenders for the erection of a swimming bath. For further particulars see advertisement in this issue.

JANUARY 29. — **Knighton.** — REPAIRS. — Knighton Guardians invite tenders for the carrying out of certain repairs to the Board-room and Union Offices at Knighton. The specification of the work to be performed can be seen by appointment with Mr. Edwin H. Deacon, Clerk to the Guardians, Knighton, Radnorshire.

JANUARY 30. — **Hampton.** — REFUSE-DESTRUCTOR BUILDINGS.—Hampton U.D.C. invite tenders for the erection of refuse-destructor buildings, etc., at the Sewage-Disposal Works, Hanworth-road, Hampton. The drawings, etc., may be seen, and bills of quantities obtained, of Mr. Sidney H. Chambers, Surveyor to the Council, Public Offices, Hampton, Middlesex, accompanied by a deposit of 2*l.*

* JANUARY 31. — **Kew.** — COTTAGES. — The Commissioners of H.M. Works and Public Buildings invite tenders for four cottages for foremen gardeners at Kew. For further particulars see advertisement in this issue.

* JANUARY 31.—**March.**—NEW COUNTY BUILDINGS.—Builders wishing to tender for the erection of new county buildings for the Isle of Ely C.C. should send their names to Mr. C. E. F. Copeman, Wisbech. For further particulars see advertisement in this issue.

FEBRUARY 1. — **Coedelay.** — COTTAGES. — Building thirty-eight cottages at Coedelay, near Tonyrefail, for the Tylcha Fach Building Company. Plans, etc., can be seen at offices of Messrs. A. O. Evans, Williams, & Evans, architects, Pontypridd.

FEBRUARY 1.—**Glasgow.**—RECONSTRUCTING A STAIR.—Glasgow Corporation invite offers for (1) the mason work; and (2) the steel work required in connexion with the proposed reconstruction of the stair leading from Springburn-road to Ayr-street. Specifications, etc., may be had on application at the office of Public Works, City Chambers, 64, Cochrane-street.

FEBRUARY 1. — **Naas.** — COTTAGES. — Naas No. 2 R.D.C. invite tenders for building ten labourers' cottages in pairs, and nine singly, and fencing. Plans, etc., to be seen at office of Mr. D. J. Purcell, Clerk of Council, Council Offices, Naas, or at the office of the Council's Engineer, Mr. Francis Bergin, B.E., T.C.D., 36, Westmoreland-street, Dublin.

FEBRUARY 3.—**St. Pinnock.**—ADDITIONS TO SCHOOL.—Cornwall Education Committee invite tenders for erecting new cloak-rooms, offices, and enlargement of playground at St. Pinnock School. Drawings, etc., may be seen at the school or at the office of Mr. B. C. Andrew, Architect to the Committee, Biddick's Court, St. Austell. Forms may be obtained at the school or from the architect.

FEBRUARY 3.—**Wadebridge.**—SCHOOL ADDITIONS.—Cornwall Education Committee invite tenders for erecting new classrooms, enlarging cloakroom, and extending playground at Wadebridge Council School. Drawings, etc., may be seen at the school or at the office of Mr. B. C. Andrew, Architect to the Committee, Biddicks Court, St. Austell. Forms may be obtained at the school or from the architect.

* FEBRUARY 9.—**Manchester.**—ADDITIONS, ETC., TO SCHOOL.—The Manchester Education Committee invite tenders for alterations and additions to Ducie-avenue Municipal School. For further particulars see advertisement in this issue.

* FEBRUARY 10.—**Hendon.**—COTTAGES.—The Hendon U.D.C. invite tenders for fifty cottages at Child's Hill. For further particulars see advertisement in this issue.

FEBRUARY 12. — **Bournemouth.** — PAVILION. — Bournemouth T.C. invite tenders for the construction of a pavilion at Winton Pleasure Grounds. Forms of tender, etc., can be obtained of the Borough Engineer, Mr. F. W. Lacey, provided that the sum of 2*l.* 2s. has been previously deposited with him.

NO DATE.—**Belfast.**—OFFICES.—Remodelling the new offices and stores in Great Patrick-street, for Messrs. J. & R. O'Kane and Co. Plans, etc., can be seen at the offices of Messrs. E. & J. Byrne, architects.

NO DATE.—**Nottingham.**—BLEACHING WORKS.—For the erection of proposed bleaching works and dressing-rooms. Application to Mr. Frederick Ball, architect, 23, King-street, Nottingham.

NO DATE.—**Rock Ferry, Birkenhead.**—LIBRARY.—For the erection of the South "Carnegie" Free Library, Grove-road, Rock Ferry, for the Birkenhead Library Committee. Plans and specifications may be seen at the office of the architect, Mr. J. R. Mewton, 59, Hamilton-square, Birkenhead, where bills of quantities may be obtained upon payment of a deposit of 10s.

NO DATE.—**Samara.**—ELECTRIC STATION.—The T.C. of Samara (Russia) invites tenders for the construction and the working of a central electric station. For particulars and conditions write to l'Administration de la Ville de Samara.

ENGINEERING, IRON, AND STEEL.

JANUARY 21. — **London.** — ROLLING STOCK. — The South Indian Railway Company, Ltd., invite tenders for the supply of (1) rolling stock (thirty-three steel covered goods bogie wagons); (2) spoke wheels with axles (132 pairs); (3) laminated, volute, and helical springs (792). Specifications, etc., may be obtained at the Company's Offices, 55, Gracechurch-street, London. A charge, which will not be returned, will be made of 1*l.* for each copy of specification No. 1, and 10s. for each copy of Nos. 2 and 3.

JANUARY 27.—**Belfast.**—Great Northern Railway Company (Ireland) Directors invite tenders for supplying and delivering into their Goods Yard at Belfast seventy-six steel plate cross girders, weighing about 18 cwt. each. Drawing, etc., can be seen at the office of Mr. W. H. Mills, Engineer-in-Chief, Amiens-street Terminus, Dublin, or copies of same at the District Engineer's Office, Belfast.

JANUARY 27.—**East Kirkby.**—SINKING WELL AND DRIVING HEADINGS.—Kirkby-in-Ashfield U.D.C. invite tenders for sinking well and driving headings at the base of the new red sandstone at their Waterworks, East Kirkby. Specification, etc., may be obtained from the Council's Consulting Engineers, Messrs. Elliott & Brown, Burton-buildings, Parliament-street, Nottingham, on payment of 1*l.* 1s.

JANUARY 28.—**Edinburgh.**—CAST-IRON POSTS.—Edinburgh and District Water Trustees invite tenders for providing and delivering cast-iron boundary posts. Copies of the specification and schedule and drawing may be obtained at the office of the Engineer, Mr. W. A. Tait, C.E., 72A, George-street, Edinburgh, on payment of 1*l.*

JANUARY 28.—**Worthing.**—WEIGHBRIDGE.—Worthing Corporation invite tenders for the supply and erection of a public weighbridge. Particulars can be obtained on application to the Borough Surveyor, Municipal Offices, Worthing.

JANUARY 30.—**Carlow.**—HEATING.—Carlow Guardians invite tenders for heating of chapel and dining-hall at the Workhouse, Carlow. Full particulars can be ascertained by inquiry at the Workhouse.

FEBRUARY 1.—**Great Yarmouth.**—PLANT.—Great Yarmouth Corporation invite tenders for one 400-kw. continuous-current traction steam generator. Copies of specification, etc., may be obtained from Mr. Gordon Bryant, Borough Electrical Engineer, Electricity Department, 26, King-street, Great Yarmouth, on payment of 1*l.* 1s.

FEBRUARY 19.—**Finchley.**—FIRE ENGINE.—The Fire Brigade Committee of U.D.C. of Finchley invite tenders for the supply of a steam motor fire engine. Full particulars may be obtained on application to the Chief Officer at the Central Station, Church End, Finchley.

FEBRUARY 22.—**Glasgow.**—PUMPING STATION.—Glasgow Corporation invite tenders for the construction of the whole of the machinery and accessories required for the equipment of their new sewage pumping station about to be built at Kinning Park. Complete specifications, etc., may be obtained at the office of the Town Clerk, City Chambers, Glasgow, by depositing 10*l.* 10s. Plans and drawings may be seen, and further particulars obtained, on presentation of the specification at the offices of Messrs. D. & A. Home Morton, C.E., 130, Bath-street, Glasgow, and 81, Francis-road, Edgbaston, Birmingham.

NO DATE.—**Salford.**—RAILS.—The Tramways Committee invite tenders for the supply of tram rails. For further particulars apply to General Manager, Tramways Office, 32, Blackfriars-street, Salford.

MISCELLANEOUS.

JANUARY 20.—**Dalton-in-Furness.**—IRON FENCING.—Dalton-in-Furness U.D.C. invite tenders for the supply and erection of about 130 lin. yds. of wrought-iron unclimbable fencing 5 ft. high. Designs and specifications must accompany tenders. Further particulars can be obtained from Mr. W. Richardson, Town Surveyor, Town Hall, Dalton-in-Furness.

JANUARY 20.—**London.**—CAST-IRON BUOY SINKERS.—Trinity House, London, E.C., invite tenders for the supply of certain cast-iron buoy sinkers. Drawings of the sinkers and forms of tender may be obtained at the House, Mr. A. Owen, Secretary.

JANUARY 20.—**Market Lavington.**—HAULING.—Devizes R.D.C. invite tenders for hauling about 1,200 yds. of chalk. Mr. Jno. Mitchell, Surveyor, Urchfont.

JANUARY 21.—**Acton.**—RAILING.—Acton D.C. invite tenders for supplying and fixing about 4,000 lin. ft. of wrought-iron railing at the North Acton Recreation Ground. Drawings can be seen, and forms of tender, etc., obtained, at 57, High-street, Acton.

JANUARY 22.—**Chiswick.**—ROLLER AND SCARIFIER.—Chiswick U.D.C. invite tenders for the supply of a 10-ton compound steam road roller, complete with

Morison's scarifier. Form of tender, etc., on application to Mr. Edward Willis, A.M.Inst.C.E., F.S.I., Engineer and Surveyor, Town Hall, Chiswick.

JANUARY 22. — **Edinburgh.** — BARRICADES. — The Scottish National Exhibition Committee, Edinburgh, invite tenders for barricades. Copies of schedules and conditions of contract can be obtained from the Secretary, Mr. James Marchbank, S.S.C., Exhibition Office, 45, York-place, Edinburgh, on deposit of 10s. 6d.

JANUARY 27.—**Islington.**—ROLLER.—Islington B.C. invite tenders for the purchase of a 10-ton and a 15-ton steam road roller, and the supply and delivery of new 10 and 15-ton steam road rollers, with scarifiers. Form of tender and particulars can be obtained upon application to the Borough Engineer, Mr. J. Patten Barber, at the Town Hall, Upper-street, N.

JANUARY 27.—**Islington.**—WATER VANS.—Islington B.C. invite tenders for the supply and delivery of four water vans. Forms of tender and particulars can be obtained upon application to the Borough Engineer, Mr. J. Patten Barber, at the Town Hall, Upper-street, Islington, N.

JANUARY 30. — **Shrewsbury.** — FURNITURE.—Salop Corporation invite tenders for the supply of new furniture, fittings, etc., for the new county buildings, The Square, Shrewsbury. Samples and sketches may be seen, and specification and schedule obtained, at office of Mr. A. T. Davis, M.Inst.C.E., County Surveyor, Shire Hall, Shrewsbury, on payment of 1*l.* 1s.

FEBRUARY 3. — **Manchester.**—TILED DADOS.—Manchester Education Committee invite tenders and samples for supplying and fixing tiled dados at the Blackley Municipal School and at the Queen-street Municipal School, Bradford, Manchester, in accordance with the specification, which may be obtained at the offices in Deansgate, Manchester, on a deposit of 1*l.* 1s.

FEBRUARY 8.—**Chelmsford.**—TEAM LABOUR.—Essex C.C. invite tenders for team labour on the main roads. Particulars at the office of the Chief Surveyor, Chelmsford.

PAINTING, etc.

JANUARY 20. — **Bristol.**—PAINTING.—Bristol Health Committee invite tenders for carrying out certain painting work to the glasshouses, etc., at Ham Green Gardens. Specifications, etc., may be obtained on application at the offices of the City Engineer, 63, Queen-square, on deposit of 10s.

JANUARY 22. — **Stoke-upon-Trent.** — PAINTING.—For certain painting at the Workhouse. Specifications can be obtained on application to Mr. C. Daniel, Clerk to the Guardians, Union Offices, Stoke-upon-Trent.

JANUARY 23. — **Glasgow.**—CLEANING, ETC.—Glasgow Corporation invite offers for the cleaning and painter work required at the various police offices and stations in the City. Specifications, etc., may be had on application at the office of Public Works, City Chambers, 64, Cochrane-street.

JANUARY 24.—**Crewe.**—PAINTING.—The Trustees of the Wedgwood Primitive Methodist Church invite tenders for painting and redecoration of church (Heath-street). Tenders to be sent to Mr. J. C. Barber, Secretary to Trustees, 2, Rigg-street, Crewe.

FEBRUARY 3. — **Manchester.** — PAINTING. — Lancashire and Yorkshire Railway Directors invite tenders for painting (thirteen contracts). Specifications and separate forms of tender may be obtained on personal application at the Engineer's Office, Hunt's Bank, Manchester.

ROADS, SANITARY, AND WATER WORKS.

JANUARY 20.—**Congleton.**—SEWER.—Congleton Corporation invite tenders for the construction of 764 yds. lin. of 12-in. sewer, 130 yds. lin. of 9-in. sewer, and 40 yds. lin. of 7-in. cast-iron syphon through the River Dane. Drawings can be seen, and particulars and bills of quantities obtained, at the office of Mr. Randle Burslam, Borough Surveyor, Town Hall, Congleton, upon a deposit of 2*l.* 2s.

JANUARY 20. — **Formby.** — STREET IMPROVEMENT. — Formby U.D.C. invite tenders for the remaking-up of that portion of the street in their district known as Duke-street, from Formby Station to a distance of some 300 yds, or thereabouts. Amended specifications, etc., from the Surveyor, Mr. A. W. Pattison, Council Offices, Formby.

JANUARY 20. — **Greetland.** — FORMING.—Greetland U.D.C. invite tenders for:—(1) Setts and kerb; (2) labour necessary in forming Haigh-street, Greetland. Plans, etc., may be seen, and separate bills of quantities obtained, at offices of Messrs. Richard Horsfall & Son, 22a, Commercial-street, Halifax.

JANUARY 20.—**Watford.**—ROAD WIDENING.—Watford U.D.C. invite tenders for works in connexion with Aldenham-road widening. Drawings, etc., may be seen, and form of tender, etc., obtained, on application to Mr. D. Waterhouse, Engineer, Council Offices, High-street, Watford.

JANUARY 21.—**Heath Town.**—SEWER.—Heath Town U.D.C. invite tenders for the construction of about 200 yds. of 9-in. sewer, in Bushbury-road. The drawings may be seen, and copies of the specifications obtained, at the office of the engineers, Messrs. Berrington, Son, & Martin, Bank-buildings, Wolverhampton, on payment of 1*l.* 1s.

JANUARY 21. — **Market Lavington.** — SEWER. — Devizes R.D.C. invite tenders for the laying-in of a sewer in High-street, Market Lavington. Mr. Jas. M. Butcher, Sanitary Inspector, 5, Southbroom-terrace, Devizes.

JANUARY 21-FEBRUARY 11.—**Thorpe Satchville.**—SEWERAGE.—The Melton Mowbray R.D.C. require tenders for the construction of about 1 mile of main earthenware and iron sewers, and sewerage-disposal works in the Parish of Thorpe Satchville. Apply to office of Mr. Edmund Jeeves, surveyor, Nottingham-street, Melton Mowbray, where plans, etc., can be seen, and quantities obtained, on depositing the sum of 5*l.*

JANUARY 22.—**Cardiff.**—ROAD WORKS.—For forming, metalling, paving, kerbing, and channelling streets. Separate tenders are required for:—(1) forming and metalling the carriageways; (2) paving, kerbing, and channelling the footways. Drawings, etc., may be seen, and forms of tender obtained, at the City Engineer's Department, City Hall, Cardiff.

JANUARY 22.—**Chiswick.**—MAKING-UP.—The U.D.C. of Chiswick invite tenders for the making-up of the carriageway of Burlington-lane, between Corney-road and Grantham-road. Form of tender on application to Mr. Edward Willis, A.M.Inst.C.E., F.S.I., Engineer and Surveyor, Town Hall, Chiswick, where the plans, etc., may be inspected.

JANUARY 22. — **Eastwood and Mearns.** — WATER SUPPLY.—The District Committee of the First or Upper District of the County of Renfrew invite offers for laying of main and branch piping. Drawings may be seen at the office of Messrs. W. R. Copland & Sons, C.E., 146, West Regent-street, Glasgow, and copies of the specification, etc., may be obtained from them on payment of a fee of 1*l.* 1s.

JANUARY 22. — **Edinburgh.** — ROAD WORKS.—Edinburgh Magistrates and Council invite tenders for the whole works in connexion with setting back boundary and parapet walls, laying cement and ash footpaths, and adjusting macadam surfaces of roads where widened at Polwarth-terrace and Colinton-road. Schedules, etc., may be obtained from the Burgh Engineer.

JANUARY 22. — **Enfield.** — MAKING-UP.—The U.D.C. of Enfield invite tenders for making-up the private street known as Catherine-road (part of), Enfield Lock. Plans, etc., can be seen, forms of tender, etc., obtained, on application to Mr. Richard Collins, the Council's Surveyor, Public Offices, Enfield, Middlesex.

JANUARY 22.—**Oadby, Blaby.**—SEWER.—The R.D.C. invite tenders for the construction of 450 lin. yds. of 9-in. diameter stoneware pipe sewer along Stoughton-lane in the Parish of Oadby. Plans, etc., can be seen, and bill of quantities obtained, at the office of the Council's Surveyor, Mr. J. Turner, Blaby-road, South Wigston.

JANUARY 22.—**York.**—ROAD WORKS, DRAINAGE, ETC. For extensive excavation, road making, and drainage required at Knavesmire, York, for the York Race Committee. Plans, etc., can be seen, and bills of quantities obtained, on payment of a deposit of 2*l.* 2s. at office of Mr. Walter. H. Brierley, F.S.A., architect, 13, Lendal, York.

JANUARY 23. — **Hackney.** — STREET WORKS.—Hackney B.C. invite tenders for kerbing, channelling, paving, making-up. The general conditions of contract and the specifications, etc., may be inspected, and copies of the bills of quantities, etc., obtained, on application to Mr. Norman Scorgie, M.Inst.C.E., Borough Engineer and Surveyor, and on payment of the sum of 1*l.* 1s.

JANUARY 23. — **St. Annes-on-Sea.**—MAKING-UP.—St. Annes-on-the-Sea U.D.C. invite tenders for the making-up of streets. Plans, etc., may be seen, and quantities, etc., obtained, on application to the Surveyor, Council Offices, St. Annes-on-the-Sea.

JANUARY 24. — **Market Harborough.** — WATER-WORKS.—Market Harborough U.D.C. invite tenders for providing and laying 1,668 yds. of 7-in. cast-iron socket pipes, etc.; also the construction of main well and valve-house, inspection chambers, drainage of two lodges, etc., in the parishes of North Kilworth and Husbands Bosworth. Plans may be seen, and copies of the specification, etc., obtained, at the offices of the engineer, Mr. H. G. Coales, A.M.Inst.C.E., Bank-chambers, Market Harborough, upon payment of 3*l.* 3s.

JANUARY 28. — **Leyton.** — STREET WORKS. — Leyton U.D.C. invite tenders for the making-up, kerbing, and paving of certain private streets. Specification, etc., may be obtained on application to Mr. William Dawson, M.Inst.C.E., the Council's Surveyor, Town Hall, Leyton.

* JANUARY 28.—**London.**—WOOD-BLOCK FLOORING.—The London C.C. invite tenders for providing and laying wood-block flooring at school buildings. For further particulars refer to an advertisement in this issue.

JANUARY 29. — **Dartford.** — STORAGE TANK. — The U.D.C. of Dartford invite tenders for the construction and fixing complete of an underground cast-iron storage tank off Victoria-road, Dartford. Plan, etc., may be seen at the office of the Surveyor, Mr. T. E. Tiffin, Council Offices, Dartford.

* JANUARY 29.—**Hammersmith.**—WOOD PAVING.—The Hammersmith B.C. invite tenders for wood paving portions of Brook Green-road. For further particulars see advertisement in this issue.

JANUARY 29.—**Kearsley.**—SETTLING TANK.—Kearsley U.D.C. invite tenders for construction of settling tank and other works at Clammerclough. Plan, etc., may be seen, and forms of tender obtained, on application at the office of Mr. Herbert Nuttall, surveyor, 20, Market-street, Bury.

JANUARY 29.—**Northwich.**—SANDIWAY WATERWORKS.—Northwich R.D.C. invite tenders for the construction of a covered brick and concrete tank (40,000 galls. capacity), a small brick water tower, and the carting, excavating for, laying, and jointing of about 600 lin. yds. of cast-iron water mains (3 in. to 6 in. diameter), including fixing valves, etc. Plans may be seen at, and copies of the specification, etc., obtained from, the office of the engineer, Mr. Wm. M. Beckett, A.M.Inst.C.E., Temple-chambers, 33, Brazenose-street, Manchester, on payment of 2*l.* 2s. (by cheque).

JANUARY 31. — **Lupton.** — WATER SUPPLY. — South Westmorland R.D.C. invite tenders for the construction of a small reservoir in the Parish of Lupton. Detailed drawings of the works may be seen at the Office of the Council, 5, Lowther-street, Kendal. Specifications, etc., can be obtained on application to Mr. Alexander Milne, Clerk to the Council, Lowther-street, Kendal.

FEBRUARY 1. — **Conway.** — WATER MAIN.—Conway Corporation invite tenders for the providing and laying of a 6-in. water main about 800 yds. in length at Deganwy. Specification, etc., may be seen and obtained from the Borough Engineer's office, Town Hall, on payment of 1*l.* 1s.

FEBRUARY 1. — **Wem.** — SEWERAGE, ETC., WORKS.—Wem U.D.C. invite tenders for sewerage and sewage disposal works. Drawings, etc., may be seen at the Town Hall, Wem, Salop, and bill of quantities, etc., obtained, on payment of the sum of 3*l.* 3s.

FEBRUARY 3.—**Marple.**—SEWERAGE.—Marple U.D.C. invite tenders for the providing and laying of about 5,820 lin. yds. of 15, 12, 9, and 6-in. stoneware and cast-iron pipes, for the drainage of the Highlane and Windlehurst portions of their district. Drawings, etc., may be seen, and forms of tender, etc. (price 3*l.* 3s. each) obtained, from Mr. Fred. H. Bancroft, A.M.Inst.C.E., F.S.I., 88, Mosley-street, Manchester.

FEBRUARY 4.—**Margate.**—WOOD PAVING.—Margate T.C. invite tenders for the laying of about 430 super. yds. of creosoted deal block wood paving at Cliff-terrace, Margate. The plan, etc., can be seen, and any further particulars obtained, on application to Mr. E. A. Borg, Borough Engineer and Surveyor, Margate.

FEBRUARY 22. — **Larne.** — WATERWORKS. — Larne U.D.C. invite tenders for the construction of works for improving the water supply. Plans, etc., may be seen, and a copy of the quantities obtained, upon payment of 1*l.* 1s. (which will not be returned), either at the office of the engineers, Messrs. Swiney & Croasdaile, MM.Inst.C.E., Avenue-chambers, Belfast, or at the office of Mr. W. G. Young, Clerk, Town Hall, Larne.

MARCH 4.—**Isle of Thanet.**—DRAINAGE WORK.—The Guardians invite tenders for the carrying out of drainage works and conversion of earth closets into water-closets for a portion of the Workhouse, Minster; also for the excavation and construction of a large rain-water tank. Plans, etc., may be seen at the office of the surveyor, Mr. G. L. Butterworth, Birchington, or at the Board-room, Minster.

NO DATE. — **Blagdon.** — EXCAVATING.—For excavating for purposes of driving adits for a water supply on "Blackdown," a spur of the Mendip Hills, at a height of about 750 ft. above sea level. The site may be viewed, and full particulars, with plan, etc., obtained, on application to Messrs. Farebrother, Ellis, & Co., land agents and surveyors, 29, Fleet-street, London, E.C.

STONE, MATERIALS, AND STORES.

JANUARY 21—**Glasgow.**—FIREBRICKS.—Glasgow Corporation invite tenders for the supply of firebricks, fireclay, and fireclay retorts required at their Gasworks. Forms of tender may be obtained on application to Mr. Alexander Wilson, the Engineer, at his office, No. 45, John-street, Glasgow.

JANUARY 21.—**Reigate.**—STONE.—Reigate Board of Guardians invite tenders for the supply of about 100 tons of quartzite spalls. Mr. Frank C. Morrison, Clerk to the said Board, No. 46, High-street, Reigate.

JANUARY 22. — **London.** — LAMPS, ETC. — The East Indian Railway Company invite tenders for the supply and delivery of:—(1) Lamps, lamp fittings, and miscellaneous glass; (2) galvanised eye and straining bolts and strand wire for fencing, etc., as per specifications to be seen at the company's offices, Nicholas-lane, London, E.C.. For each specification a fee of 1*l.* 1s. is charged, which cannot, under any circumstances, be returned.

JANUARY 22. — **Southowram.**—ROAD MATERIALS.—Southowram U.D.C. invite tenders for the supply of granite, also for the supply of dross, ironstone, or limestone. Tenders should be sent, along with sample carriage paid, to Mr. Councillor J. S. Hartley (Messrs. Hartley & Kaye, North Bridge Stone Wharf, Halifax), and should state the price per ton at which the material will be delivered.

JANUARY 22.—**Surbiton.**—MATERIALS.—The U.D.C. of Surbiton invite tenders for the execution of works and the supply of materials, etc. Specifications, etc., may be obtained at the offices of the Council, Ewell-road, Surbiton.

JANUARY 23. — **Greenwich.** — GRANITE SPALLS. — Greenwich Guardians invite tenders for a cargo of about 350 tons Channel Island granite spalls for stonebreaking for Grove Park Workhouse, Lee. Forms of tender can be obtained on application at the Clerk's office, Woolwich-road, Greenwich.

JANUARY 23. — **Lee.** — GRANITE SPALLS. — Greenwich Union invite tenders for a cargo of about 350 tons Channel Island granite spalls for stone-breaking, Grove Park Workhouse, Lee. Forms of tender can be obtained on application at the Clerk's office, Woolwich-road, Greenwich.

JANUARY 24.—**Rhondda.**—STORES.—Rhondda U.D.C. invite tenders for stores in seven separate contracts. Specifications and forms of tender may be obtained at the office of the Engineer and Surveyor, Council Offices, Pentre, Rhondda.

JANUARY 24.—**Spilsby.**—GRANITE AND SLAG.—Spilsby R.D.C. invite tenders for granite and slag. Specifications, etc., may be obtained on application to Mr. Thos. A. Busbridge, C.E., District Surveyor of Highways, Spilsby.

JANUARY 25. — **Birmingham.** — STORES.—Birmingham Public Works Committee invite tenders for the supply of stores for one year. Samples and patterns may be seen on application to the storekeeper at the Lamp Department, Park-street, and the Corporation Wharf, Sheepcote-street. Forms of tender, etc., may be obtained at the City Surveyor's office, Council House, Birmingham, on payment of 1*l.* for each copy.

JANUARY 25. — **Birmingham.** — STONES, ETC.—Birmingham Public Works Committee invite tenders for the supply of materials for one year (granite kerbs, setts, crossing stones, etc.). Forms of tender, etc., may be obtained at the City Surveyor's office, Council House, Birmingham, on payment of 1*l.* for each copy.

JANUARY 25.—**Norwich.**—MATERIALS.—Norfolk C.C. invite tenders for the supply of materials, team labour, tools, etc. Specification, etc., may be obtained at office of Mr. T. H. B. Heslop, M.Inst.C.E., County Surveyor, Norwich.

JANUARY 25. — **Tenterden.**—ROAD MATERIAL.—Tenterden T.C. invite tenders for the supply of quartzite, basalt, or other approved macadam. Also the carriage of above. Further particulars and form of tender may be obtained of Mr. W. L. C. Turner, Borough Surveyor, Town Hall, Tenterden.

JANUARY 27.—**East Grinstead.**—ROAD MATERIALS.—The R.D.C. of East Grinstead invite tenders for the supply of materials. Forms of tender will be sent to any person desiring to tender, on receipt by

Mr. Francis S. White, Clerk to the Council, East Grinstead, of a stamped addressed foolscap envelope.

JANUARY 28.—**Halifax.**—STORES.—Halifax Gasworks Committee invite tenders for the supply of :—(1) Cast-iron pipes; (2) wrought-iron tubes and fittings; (3) oils, paints, etc. (seventeen contracts in all). Forms of tender and further information may be obtained on application to Mr. J. Wilkinson, F.C.S., Engineer, Gasworks, Halifax.

JANUARY 29.—**Northwich.**—CAST-IRON PIPES.—Northwich R.D.C. invite tenders for the supply and delivery at Cuddington Station (Cheshire Lines Railway) of about 21 tons of 3-in., 4-in., 5-in., and 6-in. cast-iron pipes and specials. Drawings may be seen at, and copies of the specification, etc., obtained from, the office of the engineer, Mr. Wm. M. Beckett, A.M.Inst.C.E., 33, Brazenose-street, Manchester, on payment of 2*l.* 2*s.* (by cheque).

JANUARY 30.—**Chipping Norton.**—GRANITE.—The R.D.C. invite tenders for Leicester granite, Hartshill, and Rowley Regis stones. Specification and form of tender may be obtained from Mr. E. Entwistle, District Surveyor, Charlbury, Oxon, on receipt of stamped and addressed envelope.

JANUARY 30.—**Desborough (Northants).**—GRANITE.—For the supply of about 500 tons of granite. Further particulars and forms of tender may be obtained from Mr. G. E. Marlow, Surveyor, Desborough.

FEBRUARY 1.—**Amersham.**—FLINTS AND GRANITE.—Amersham R.D.C. invite tenders for the supply and delivery of 6,230 cubic yds. of flints and 230 tons of granite. Lists of quantities and forms of tender may be obtained on application to the surveyor, Mr. Levi Hilsden, Amersham.

FEBRUARY 1.—**Bourne.**—GRANITE.—Bourne R.D.C. invite tenders for the supply of about 6,000 tons of granite and 2,000 tons of slag, at per ton. Forms to be obtained on application to Mr. Thomas Lake, District Surveyor, Bourne.

FEBRUARY 1.—**Hailsham.**—ROAD MATERIAL.—Hailsham R.D.C. invite tenders for granite, stone, flints, beach, and cartage. Form of tender from Mr. Edmund Catt, Clerk to the Council, Clerk's office, 17, London-road, Hailsham.

FEBRUARY 3.—**Derby.**—ROAD MATERIALS.—Derbyshire C.C. invite tenders for road material. Forms of tender, etc., may be obtained at office of Mr. J. W. Horton, A.M.Inst.C.E., County Surveyor, County Offices, St. Mary's-gate, Derby.

FEBRUARY 3.—**Worksop.**—SLAG.—Worksop U.D.C. invite tenders for slag. Forms of tender can be obtained on sending stamped addressed envelope to Mr. H. Featherston, Clerk, Town Hall, Worksop.

* FEBRUARY 6.—**West Ham.**—SUPPLIES, ETC.—The West Ham B.C. invite tenders for supplies, etc. For further particulars see advertisement in this issue.

FEBRUARY 8.—**Chelmsford.**—GRANITE KERB SETTS, ETC.—Essex C.C. (Highways, Bridges, and Buildings Committee) invite tenders for the supply of Norway granite kerb and setts, and York stone edging. Forms of tender, etc., can be obtained at the Chief Surveyor's office at Chelmsford.

FEBRUARY 10.—**Wallasey.**—LIME.—The Health Committee of the Wallasey U.D.C. invite tenders for the supply of lime. Further particulars, etc., may be obtained on application at the offices of Mr. W. H. Travers, District Engineer and Surveyor, Public Offices, Egremont, Cheshire.

FEBRUARY 10.—**Wallasey.**—STORES.—Wallasey Works Committee invite tenders for the supply of materials. Further particulars, etc., may be obtained on application at the office of Mr. W. H. Travers, District Engineer and Surveyor, Public Offices, Egremont, Cheshire.

FEBRUARY 12.—**Bradford.**—ROAD METAL.—The Bradford Corporation invite tenders for the supply of about 20,000 tons of road metal. Form of tender may be obtained on application at the office of Mr. J. H. Cox, City Surveyor, at the Town Hall.

FEBRUARY 15.—**Folkestone.**—ANNUAL CONTRACTS.—The Corporation of Folkestone invite tenders for the supply of goods for the period of one year. Particulars and forms of tender may be obtained on application to Mr. A. E. Nichols, A.M.Inst.C.E., Borough Engineer and Surveyor, Corporation Offices, Folkestone.

FEBRUARY 15.—**Worcestershire.**—ROAD MATERIAL.—The Highways and Bridges Committee invite tenders for the supply of road materials. Full particulars and forms of tender will be forwarded on application to Mr. J. H. Garrett, County Road Surveyor, Shirehall, Worcester.

FEBRUARY 18.—**Stoke-upon-Trent.**—STORES.—The Corporation of Stoke-upon-Trent invite tenders for the supply of materials and goods. Particulars, etc., may be obtained upon application at office of Mr. A. Burton, A.M.Inst. C.E., etc., Borough Surveyor, Town Hall, Stoke-upon-Trent.

FEBRUARY 20.—**Gloucester.**—ROAD MATERIALS.—Gloucestershire C.C. invite tenders for the supply of stone for use on main roads. Forms of tender can be obtained from the County Surveyor, Mr. E. S. Sinnott, Shire Hall, Gloucester.

Public Appointments.

Nature of Appointment.	By whom Advertised.	Salary.	Application to be in
*ARCHITECT'S ASSISTANT	Glamorgan Education Com.	2*l.* 10*s.* per week	Jan. 24
*QUANTITY SURVEYOR	Essex Education Committee	Not stated	Jan. 31

Auction Sales.

Nature and Place of Sale.	By whom Offered.	Date of Sale.
*SCAFFOLDING AND TIMBER, ETC., BATTERSEA—103, Lavender Hill	J. Hibbard & Sons	Jan. 20
*BUILDER'S, ETC., STOCK AND PLANT—At 78, Northcote-road, Battersea Rise	Harold Griffin	Jan. 22, etc.
*SHRUBS, TREES, PLANTS, ETC., SOUTH WOODFORD—On the Premises	Protheroe & Morris	Jan. 28
*BUILDERS' MERCHANT'S, ETC., STOCK-IN-TRADE—At Craven House, Kingsway	J. T. Skelding	Feb. 4

PATENTS.—*Continued from page 78.*

5,033 of 1907.—E. A. BROWN: *Portable Pipe Benders.*

This relates to a pipe bender of the class which comprises a grooved semi-cylinder between which and a grooved pillar the pipe is placed during the act of bending, and consists in providing the semi-cylinder with two sets of grooves for pipes of various gauges, and making the pillar reversible so as to render it useable with either set of grooves, means being also provided for adjusting the distance between the semi-cylinder and the pillar.

6,502 of 1907.—C. S. STONE: *Window Fasteners.*

This relates to a self-locking window fastener that cannot be opened from the outside, the top part of the catch being perforated and a centre piece fitted into this open space. Holes are bored through the two sides of this perforated opening, and a hole through the centre piece, a rivet going through the three holes and fitting very loosely in the centre piece so that it will be movable and free to work up and down the lower part of the catch, the seat being made to gradually rise from the end to about halfway, then sloping down to the back part of the catch. In the centre of this half a groove is sunk so that when the centre piece, falling down into the sunk part, cannot go any further that way, the bottom end of the centre piece always falls into the sunk part, and is either locked or left unlocked. To lock this fastener the hand-knob is taken and the fastener turned round past the centre piece, whereby the fastener is locked and cannot be opened from the outside. To unlock the fastener the top part of the centre piece must be pressed, and the fastener then turned back, and the window can be opened.

6,665 of 1907.—W. J. GIBSON: *Domestic Fireplaces.*

This relates to domestic fireplaces, and consists essentially in forming beneath the grate and in comparatively close proximity thereto, or beneath a supplementary part applied to the grate, a radiating surface or surfaces of fire-brick sloping downwardly towards a central ash chamber, or aperture communicating with an ash chamber beneath, and at such an angle that the ashes do not collect upon such surface or surfaces, but are immediately discharged to the central chamber. When the device is to be applied to existing flat-bottomed grates, gratings may be arranged at an angle at the sides or sides and back of the grate, thus constricting it to a trough-like form, and upon the surface of the grate and behind these gratings the sloping radiating surface are arranged, the ashes falling upon them and being discharged between the bars of the original grate bottom.

7,739 of 1907.—O. SCHREIBER: *Manufacture of Materials for Roofing, Damp-courses, and the like.*

This relates to a material for the manufacture of roofing, damp-courses, and the like, consisting of pitch-like residue from the distillation of tar or petroleum, or other pitch-like residue, or a mixture of the same oxidised by blowing into the same, whilst heated, atmospheric air, and at the same time adding an oxidising agent such as manganese dioxide with or without sulphuric acid or the like, formaldehyde being introduced after oxidisation, but before cooling, of the mass.

10,132 of 1907.—W. A. HILDYARD: *Casement Stays and the like.*

This relates to a casement and the like stay, comprising two telescopic parts, one secured to the casement and the other to the window or the like, the outer part of the fitting being provided with a longitudinal slot and a series of transverse slots, and the inner part of the fitting having a draw-handle rotatably mounted thereon so as to ride in the longitudinal slot and adapted to be turned to engage with the transverse slots, a transverse bolt passed through a bracket fastened to the casement and through the casement end of the stay, said bolt having a spring friction device bearing thereagainst so as to hold it in any position in which it may be placed, and a nose on said bolt to engage a keeper on the window frame or the like.

10,932 of 1907.—W. P. NOICUIT: *Files or Rasps.*

This relates to files or rasps having the teeth formed in an arc of a circle and upon both sides of a comparatively thin plate, and consists in arranging the teeth upon the opposite sides of the files so that the direction of the curvature of the teeth is opposed.

15,008 of 1907.—G. MEYER: *Reinforced Concrete.*

This relates to a section or girder of reinforced concrete having two parts normally inclined to each other so as to form a right angle, the outer corner of which is recessed to engage with the correspondingly shaped edge of one of the sides or parts of the adjacent section or girder, and has the edge of one of its parts shaped to fit in the recess of the section or girder at its other side so that the girders can be easily joined together to form a continuous floor or wall.

15,421 of 1907.—W. H. DINGLE and J. M. URQUHART: *Chimney-pots or Cowls and Ventilators.*

This relates to a chimney-pot, cowl, or ventilator, consisting of a central or inner part carrying two draught-directing plates on opposite sides, one of which is of double form and directs the draught through an opening opposite to it, and the other springs from below an opening in the chimney and extends upwards, an outer part being arranged over the central or inner part with air space between them. When the cowl or pot is made in two separate parts the outer is of tubular form, and is arranged so that it can be lifted from off the inner part, which may carry struts or guides to hold the outer member in place, or the struts may be on the inside of the outer chamber.

16,687 of 1907.—W. C. BROCKSIEB and M. P. TOQUAZZINI: *Chain Pipe Wrenches.*

This relates to a chain pipe wrench of the type in which the chain member is anchored at one end to a point on the operating handle, and detachably connected at the other end by a hook member to another point on the handle, comprising a pair of forwardly and laterally extending parallel jaws rigid with the handle, a pair of pins or the like extending between the jaws, and located at opposite lateral points, and a chain member connected at one end to one of the pins and provided at the other end with means for engaging a double hook member pivotally mounted upon the other pin.

3,960 of 1907.—H. JOHNSTON: *Tipping-tank Flushing Cistern for water-closets.*

This relates to a cistern made entirely without valves to prevent possible waste of water, and to ensure perfect and regular flushing of a water-closet without retaining hold of the chain. It consists of an outer cistern and an inner cistern which has two pivots working in two bearings fixed on inside of outer cistern. The inner cistern is kept filled in the usual way by a ball-tap, and when full is tipped up by pulling chain, and, being made bevelled at one end, immediately discharges the whole of its contents into outer cistern, and consequently through flushing pipe. The inner cistern, while emptying itself, also keeps the ball-tap

shut, and, being made a little heavier at the back, immediately rights itself when the water is discharged, and is again filled by ball-tap and made ready for further use.

6,781 of 1907.—T. WEST: *Spigot and Socket Joints for Sanitary-ware Pipes.*

This relates to that class of spigot and socket joints for pipes which are characterised by the same, when in position, presenting a perfectly continuous inner wall, thereby preventing the formation of humps in the interior of the pipe which cause interruption in the flow of sewage or the like through said pipe, and consists in forming the spigot end tapered or wedge-shape to closely engage with a correspondingly shaped annular groove in the socket end, thereby making a first or centreing joint, the space between the outer wall of the spigot end and the inner wall of the socket end being filled with cement or the like, thereby making the second joint.

TO CORRESPONDENTS.

NOTE.—The responsibility of signed articles, letters, and papers read at meetings rests, of course, with the authors.

We cannot undertake to return rejected communications; and the Editor cannot be responsible for drawings, photographs, manuscripts, or other documents, or for models or samples, sent to or left at this office, unless he has specially asked for them.

Letters or communications (beyond mere news items) which have been duplicated for other journals are NOT DESIRED.

All communications must be authenticated by the name and address of the sender whether for publication or not. No notice can be taken of anonymous communications.

We are compelled to decline pointing out books and giving addresses.

Any commission to a contributor to write an article, or to execute or lend a drawing for publication, is given subject to the approval of the article or drawing, when received, by the Editor, who retains the right to reject it if unsatisfactory. The receipt by the author of a proof of an article in type does not necessarily imply its acceptance. The Editor cannot undertake to read and consider articles offered for acceptance unless they are type-written.

All communications regarding literary and artistic matters should be addressed to THE EDITOR; those relating to advertisements and other exclusively business matters should be addressed to THE PUBLISHER, and *not* to the Editor.

MEETINGS.

FRIDAY, JANUARY 17.

Glasgow Architectural Craftsmen's Society.—Mr. J. Scott on "Prosaic Discourse on Colour." 8 p.m.

Institution of Mechanical Engineers.—Professor Frederic W. Burstall on "Third Report to the Gas-Engine Research Committee." 8 p.m.

Institution of Civil Engineers (Students' Meeting).—Mr. H. Lapworth, D.Sc., on "The Principles of Engineering Geology." 8 p.m.

SATURDAY, JANUARY 18.

Royal Institution.—Professor Gisbert Kapp on "The Electrification of Railways."—I. 3 p.m.

MONDAY, JANUARY 20.

Royal Institute of British Architects.—(1) To read the Deed of Award of Prizes and Studentships for 1907-8. (2) Mr. W. T. Oldrieid, F.S.A. Scot., on "Royal Palaces in Scotland," with lantern-slide illustrations. 8 p.m.

Liverpool Architectural Society.—Mr. J. Watson Cabré on "My Tour in Italy," illustrated by lantern slides. 6 p.m.

University of London (South Kensington).—Mr. Banister Fletcher on "English Gothic: Buttresses, Towers, and Spires, etc." 8 p.m.

Society of Arts (Cantor Lecture).—Mr. Henry Hardinge Cunynghame, C.B., on "The Theory and Practice of Clock-making." 8 p.m.

TUESDAY, JANUARY 21.

Institution of Civil Engineers.—(1) Sir John W. Ottley, K.C.I.E., and Mr. W. Brightmore, D.Sc., on "Experimental Investigations of the Stresses in Masonry Dams Subjected to Water Pressure." (2) Messrs. J. S. Wilson and W. Gore on "Stresses in Dams: an Experimental Investigation by Means of India-Rubber Models." (3) Mr. E. Prescot Hill on "Stresses in Masonry Dams." 8 p.m.

Society of Arts (Applied Art Section).—Mrs. Hadaway on "The Developments in the Art of Jewellery." 8 p.m.

WEDNESDAY, JANUARY 22.

Institution of Civil Engineers.—Students' visit to the Buildings of the Franco-British Exhibition, Shepherd's Bush, W.

Edinburgh Architectural Association.—Mr. F. C. Mears on "Essentials in Architecture." 8 p.m.

THURSDAY, JANUARY 23.

London Institution.—Mr. C. J. Tabor on "The Furniture of an English House a Century Ago." illustrated by specimens. 6 p.m.

Royal Institution.—Professor W. W. Watts, M.A., F.R.S., on "Recent Light on Ancient Physiographies."—II. 3 p.m.

Institution of Electrical Engineers.—Mr. Rudolph Goldschmidt on "Standard Performances of Electrical Machinery." 8 p.m.

FRIDAY, JANUARY 24.

Architectural Association.—Mr. J. Dudley Forsyth on "Stained Glass." 7.30 p.m.

Institution of Civil Engineers (Students' Meeting).—(1) Mr. J. R. Wade on "A Cost Theory of Reinforced-Concrete Beams." (2) Mr. E. I. Spiers, B.A., on "The Neutral Axis in Reinforced-Concrete Beams." 8 p.m.

SATURDAY, JANUARY 25.

Royal Institution.—Professor Gisbert Kapp on "The Electrification of Railways."—II. 3 p.m.

PRICES CURRENT OF MATERIALS.

*** Our aim in this list is to give, as far as possible, the *average* prices of materials, not necessarily the lowest. Quality and quantity obviously affect prices—a fact which should be remembered by those who make use of this information.

BRICKS, &c.

	£ s. d.	
Hard Stocks	1 6 0	per 1000 alongside, in river.
Rough Stocks and Grizzles	1 5 0	" " "
Picked Stocks for Facings	2 10 0	" delivered.
Flettons	1 5 6	" at railway depôt.
Red Wire Cuts	1 14 0	" " "
Best Fareham Red	3 12 0	" " "
Best Red Pressed Ruabon Facing	5 0 0	" " "
Best Blue Pressed Staffordshire	3 15 0	" " "
Do. Bullnose	4 0 0	" " "
Best Stourbridge Fire Bricks	3 14 0	" " "
GLAZED BRICKS.		
Best White and Ivory Glazed Stretchers	12 0 0	" " "
Headers	11 0 0	" " "
Quoins, Bullnose, and Flats	16 0 0	" " "
Double Stretchers	19 0 0	" " "
Double Headers	16 0 0	" " "
One Side and two Ends	19 0 0	" " "
Two Sides and one End	20 0 0	" " "
Splays, Chamferred, Squints	20 0 0	" " "
Best Dipped Salt Glazed Stretchers, and Header	12 0 0	" " "
Quoins, Bullnose, and Flats	14 0 0	" " "
Double Stretchers	15 0 0	" " "
Double Headers	14 0 0	" " "
One Side and two Ends	15 0 0	" " "
Two Sides and one End	15 0 0	" " "
Splays, Chamferred, Squints	14 0 0	" " "
Second Quality White and Dipped Salt Glazed	2 0 0	" less than best.

	s. d.	
Thames and Pit Sand	6 6	per yard, delivered.
Thames Ballast	5 0	" "
Best Portland Cement	30 0	per ton, "
Best Ground Blue Lias Lime	19 6	" "

NOTE.—The cement or lime is exclusive of the ordinary charge for sacks.

Grey Stone Lime ..... 12s. 0d. per yard, delivered.
Stourbridge Fireclay in sacks 27s. 6d. per ton at rly. dpt.

STONE.

	s. d.	
BATH STONE—delivered on road waggons, Paddington Depôt	1 6½	per ft. cube.
Do. do. delivered on road waggons, Nine Elms Depôt	1 8¼	" "
PORTLAND STONE (20 ft. average)—		
Brown Whitbed, delivered on road waggons, Paddington Depôt, Nine Elms Depôt, or Pimlico Wharf	2 1	" "
White Basebed, delivered on road waggons, Paddington Depôt, Nine Elms Depôt, or Pimlico Wharf	2 2½	" "

	s. d.	
Ancaster in blocks	1 10	per ft. cube, delivered dépôt.
Beer "	1 6	" "
Greenshill "	1 10	" "
Darley Dale in blocks	2 4	" "
Red Corsehill "	2 2	" "
Closeburn Red Freestone	2 0	" "
Red Mansfield "	2 4	" "
YORK STONE—*Robin Hood Quality.*		
Scappled random blocks	2 10	" "
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2 3	per ft. super., "
6 in. rubbed two sides ditto, ditto	2 6	" "
3 in. sawn two sides slabs (random sizes)	0 11½	per ft. cube, "
2 in. to 2½ in. sawn one side slabs (random sizes)	0 7½	" "
1½ in. to 2 in. ditto, ditto	0 6	" "
HARD YORK—		
Scappled random blocks	3 0	" "
6 in. sawn two sides landings to sizes (under 40 ft. super.)	2 8	per ft. super. "
6 in. rubbed two sides ditto	3 0	" "
3 in. sawn two sides slabs (random sizes)	1 2	" "
2 in. self-faced random flags	0 5	" "

SLATES.

In. In.	£ s. d.	
20×10 best blue Bangor	13 2 6	per 1000 of 1200 at rly. dpt.
20×12 " "	13 17 6	" "
20×10 first quality	13 0 0	" "
20×12 " "	13 15 0	" "
16×8 " "	7 5 0	" "
20×10 best blue Portmadoc	12 12 6	" "
16×8 " "	6 12 6	" "
20×10 best Eureka unfading green	15 17 6	" "
20×12 " "	18 7 6	" "
18×10 " "	13 5 0	" "
16×8 " "	10 5 0	" "

SLATES (*continued*).

In. In.	£ s. d.	
20×10 permanent green	11 12 6	per 1000 of 1200 at rly. dpt.
18×10 " "	9 12 6	" "
16×8 " "	6 12 6	" "

TILES.

	s. d.	
Best plain red roofing tiles	42 0	per 1000 at rly. depôt.
Hip and Valley tiles	3 7	per doz. "
Best Broseley tiles	50 0	per 1000 "
Do. Ornamental tiles	52 6	" "
Hip and Valley tiles	4 0	per doz. "
Best Ruabon red, brown, or brindled do. (Edwards)	57 6	per 1000 "
Do. Ornamental do.	60 0	" "
Hip tiles	4 0	per doz. "
Valley tiles	3 0	" "
Best Red or Mottled Staffordshire do. (Peakes)	51 9	per 1000 "
Do. Ornamental do.	54 6	" "
Hip tiles	4 1	per doz. "
Valley tiles	3 8	" "
Best "Rosemary" brand plain tiles	48 0	per 1000 "
Best Ornamental tiles	50 0	" "
Hip tiles	4 0	per doz. "
Valley tiles	3 8	" "
Best "Hartshill" brand plain tiles, sand-faced	50 0	per 1000 "
Do. pressed	47 6	" "
Do. Ornamental do.	50 0	" "
Hip tiles	4 0	per doz. "
Valley tiles	3 6	" "

WOOD.

BUILDING WOOD.	At per standard. £ s. d.	£ s. d.
Deals: best 3 in. by 11 in. and 4 in. by 9 in. and 11 in.	13 10 0	... 15 0 0
Deals: best 3 by 9	13 0 0	... 14 0 0
Battens: best 2½ in. by 7 in. and 8 in., and 3 in. by 7 in. and 8 in.	11 0 0	... 12 0 0
Battens: best 2½ by 6 and 3 by 6	0 10 0	less than 7 in and 8 in.
Deals: seconds	1 0 0	less than best.
Battens: seconds	0 10 0	" "
2 in. by 4 in. and 2 in. by 6 in.	9 0 0	... 10 0 0
2 in. by 4½ in. and 2 in. by 5 in.	8 10 0	... 9 10 0
Foreign Sawn Boards— 1 in. and 1½ in. by 7 in.	0 10 0	more than battens.
¾ in.	1 0 0	"
Fir timber: best middling Danzig or Memel (average specification)	At per load of 50 ft. 4 10 0	... 5 0 0
Seconds	4 0 0	... 4 10 0
Small timber (8 in. to 10 in.)	3 12 6	... 3 15 0
Small timber (6 in. to 8 in.)	3 0 0	... 3 10 0
Swedish balks	2 10 0	... 3 0 0
Pitch-pine timber (30 ft. average)	4 0 0	... 4 15 0
JOINERS' WOOD.	At per standard.	
White Sea: first yellow deals, 3 in. by 11 in.	24 0 0	... 25 0 0
3 in. by 9 in.	22 0 0	... 23 " "
Battens, 2½ in. and 3 in. by 7 in.	16 10 0	... 18 0 0
Second yellow deals, 3 in. by 11 in.	18 10 0	... 20 0 0
" " 3 in. by 9 in.	17 10 0	... 19 0 0
Battens, 2½ in. and 3 in. by 7 in.	13 10 0	... 14 10 0
Third yellow deals, 3 in. by 11 in. and 9 in.	13 10 0	... 15 0 0
Battens, 2½ in. and 3 in. by 7 in.	11 0 0	... 12 0 0
Petersburg first yellow deals, 3 in. by 11 in.	21 0 0	... 22 10 0
Do. 3 in. by 9 in.	18 0 0	... 19 10 0
Battens	13 10 0	... 15 0 0
Second yellow deals, 3in. by 11in.	16 0 0	... 17 0 0
Do. 3 in. by 9 in.	14 10 0	... 16 0 0
Battens	11 0 0	... 12 10 0
Third yellow deals, 3 in. by 11 in.	13 0 0	... 14 0 0
Do. 3 in. by 9 in.	12 10 0	... 14 0 0
Battens	10 0 0	... 11 0 0
White Sea and Petersburg— First white deals, 3 in. by 11 in.	14 10 0	... 15 10 0
" " 3 in. by 9 in	13 10 0	... 14 10 0
Battens	11 0 0	... 12 0 0
Second white deals, 3in. by 11 in.	13 10 0	... 14 10 0
" " 3 in. by 9 in.	12 10 0	... 13 10 0
" " battens	10 0 0	... 11 0 0
Pitch-pine: deals	18 0 0	... 21 0 0
Under 2 in. thick extra	0 10 0	... 1 0 0
Yellow pine—First, regular sizes	44 0 0	upwards.
Oddments	32 0 0	"
Seconds, regular sizes	33 0 0	"
Yellow Pine oddments	28 0 0	"
Kauri Pine—Planks, per ft. cube	0 3 6	... 0 5 0
Danzig and Stettin Oak Logs— Large, per ft. cube	0 3 0	... 0 3 6
Small " "	0 2 6	... 0 2 8
Wainscot Oak Logs, per ft. cube	0 5 6	... 0 6 0
Dry Wainscot Oak, per ft. sup. as inch	0 0 8½	... 0 0 9½
¾ in. do. do.	0 0 7	... —
Dry Mahogany—Honduras, Tabasco, per ft. super. as inch	0 0 9	... 0 1
Selected, Figury, per ft. super. as inch	0 1 6	... 0 2 6
Dry Walnut, American, per ft. super. as inch	0 0 10	... 0 1 0
Teak, per load	17 0 0	... 22 0 0
American Whitewood Planks, per ft. cube	0 4 0	... 0 5 0
Prepared Flooring, etc.—	Per square.	
1 in. by 7 in. yellow, planed and shot	0 13 6	... 0 17 0
1 in. by 7 in. yellow, planed and matched	0 14 0	... 0 18 0
1¼ in. by 7 in. yellow, planed and matched	0 16 0	... 1 0 0
1 in. by 7 in. white, planed and shot	0 12 0	... 0 14 6
1 in. by 7 in. white, planed and matched	0 12 6	... 0 15 0
1¼ in. by 7 in. white, planed and matched	0 15 0	... 0 16 6
¾ in. by 7 in. yellow, matched and beaded or V-jointed brds.	0 11 0	... 0 13 6
1 in. by 7 in. " "	0 14 0	... 0 18 0
¾ in. by 7 in. white " "	0 10 0	... 0 11 6
1 in. by 7 in. " "	0 12 9	... 0 15 0

6 in. at 6d. to 9d. per square less than 7 in.

JOISTS, GIRDERS, &c.

	In London, or delivered Railway Vans, per ton. £ s. d.		£ s. d.
Rolled Steel Joists, ordinary sections	7 15 0	...	8 5 0
Compound Girders, ordinary sections	10 0 0	...	11 0 0
Steel Compound Stanchions	12 10 0	...	13 10 0
Angles, Tees, and Channels, ordinary sections	9 15 0	...	10 15 0
Flitch Plates	9 15 0	...	10 15 0
Cast Iron Columns and Stanchions including ordinary patterns	8 0 0	...	9 0 0

METALS.

	Per ton, in London. £ s. d.		£ s. d.
IRON—			
Common Bars	8 10 0	...	9 0 0
Staffordshire Crown Bars, good merchant quality	9 5 0	...	9 15 0
Staffordshire "Marked Bars"	11 0 0	...	—
Mild Steel Bars	9 10 0	...	9 15 0
Hoop Iron, basis price	9 15 0	...	10 0 0
" " Galvanised	17 10 0	...	—
("And upwards, according to size and gauge.)			
Sheet Iron Black—			
Ordinary sizes to 20 g.	10 0 0	...	—
" " 24 g.	11 0 0	...	—
" " 26 g.	12 10 0	...	—
Sheet Iron, Galvanised, flat, ordinary quality—			
Ordinary sizes, 6 ft. by 2 ft. to 3 ft. to 20 g.	16 0 0	...	—
Ordinary sizes to 22 g. and 24 g.	16 10 0	...	—
" " 26 g.	17 0 0	...	—
Sheet Iron, Galvanised, flat, best quality—			
Ordinary sizes to 20 g.	19 0 0	...	—
" " 22 g. and 24 g.	19 10 0	...	—
" " 26 g.	21 0 0	...	—
Galvanised Corrugated Sheets—			
Ordinary sizes, 6 ft. to 8 ft. 20 g.	16 0 0	...	—
" " 22 g. and 24 g.	16 5 0	...	—
" " 26 g.	17 10 0	...	—
Best Soft Steel Sheets, 6 ft. by 2 ft. to 3 ft. by 20 g. and thicker	13 0 0	...	—
Best Soft Steel Sheets, 22 g. & 24 g.	14 0 0	...	—
" " " 26 g.	16 0 0	...	—
Cut Nails, 3 in. to 6 in.	10 15 0	...	11 5 0
(Under 3 in., usual trade extras.)			

LEAD, &c.

	Per ton, in London. £ s. d.		£ s. d.
LEAD—Sheet, English, 3lb. and up.	17 10 0	...	—
Pipe in coils	18 0 0	...	—
Soil pipe	20 10 0	...	—
Compo pipe	21 10 0	...	—
ZINC—Sheet—			
Vieille Montague ...ton	29 0 0	...	—
Silesian	28 15 0	...	—
COPPER—			
Strong Sheet ...per lb.	0 1 1	...	—
Thin " "	0 1 2	...	—
Copper nails "	0 0 11	...	—
Co per wire "	0 0 10	...	—
BRASS—			
Strong Sheet "	0 1 0	...	—
Thin "	0 1 1	...	—
TIN—English Ingots "	0 1 4	...	—
SOLDER—Plumbers' "	0 0 7	...	—
Tinmen's "	0 0 9	...	—
Blowpipe "	0 0 11	...	—

ENGLISH SHEET GLASS IN CRATES OF STOCK SIZES.

15 oz. thirds	2½d. per ft. delivered.
" fourths	1⅞d. " "
21 oz. thirds	3½d. " "
" fourths	2⅝d. " "
26 oz thirds	4½d. " "
" fourths	3½d. " "
32 oz. thirds	5d. " "
" fourths	4½d. " "
Fluted Sheet, 15 oz.	3½d. " "
" 21 oz.	4½d. " "

ENGLISH ROLLED PLATE IN CRATES OF STOCK SIZES.

⅛ Hartley's	2½d. per ft. delivered.
¼ "	2½d. " "
⅜ "	3d. " "
Figured and Oxford Rolled "Oceanic" Glass, white	4d. " "
Do. " tinted	5½d. " "

OILS, &c.

		£	s.	d.
Raw Linseed Oil in pipes	per gallon	0	2	1
" " in barrels	"	0	2	2
" " in drums	"	0	2	3
Boiled " in pipes	"	0	2	2
" " in barrels	"	0	2	3
" " in drums	"	0	2	4
Turpentine in barrels	"	0	3	3
" in drums	"	0	3	5
Genuine Ground English White Lead	per ton	23	0	0
Red Lead, Dry	"	22	10	0
Best Linseed Oil Putty	per cwt.	0	7	0
Stockholm Tar	per barrel	1	12	0

VARNISHES, &c.

	Per gallon. £ s d
Fine Pale Oak Varnish	0 8 0
Pale Copal Oak	0 10 6
Superfine Pale Elastic Oak	0 12 6
Fine Extra Hard Church Oak	0 10 0
Superfine Hard-drying Oak, for seats of Churches	0 14 0
Fine Elastic Carriage	0 12 6
Superfine Pale Elastic Carriage	0 16 0
Fine Pale Maple	0 16 0
Finest Pale Durable Copal	0 18 0
Extra Pale French Oil	1 1 0
Eggshell Flatting Varnish	0 18 0
White Copal Enamel	1 4 0
Extra Pale Paper	0 12 0
Best Japan Gold Size	0 10 6
Best Black Japan	0 16 0
Oak and Mahogany Stain	0 9 0
Brunswick Black	0 8 0
Berlin Black	0 16 0
Knotting	0 10 9
French and Brush Polish	0 10 6

TENDERS.

Communications for insertion under this heading should be addressed to "The Editor," and must reach us *not later than* 10 *a.m. on Thursdays.* [N.B.—We cannot publish Tenders unless authenticated either by the architect or the building-owner; and we cannot publish announcements of Tenders accepted unless the amount of the Tender is stated, nor any list in which the lowest Tender is under 100*l.*, unless in some exceptional cases and for special reasons.]

* Denotes *accepted.* † Denotes *provisionally accepted.*

ALNWICK.—For the extension of sewerage in Fisher-lane, and extension of watermains at Stott-street and Prudhoe-street, etc., for the Urban District Council. Mr. Geoffrey Wilson, Town Surveyor, Alnwick. Quantities by Surveyor:—

For Sewerage Extension.

J. & G. Green	£119 18 6
C. Thompson & Sons	105 0 0
J. Whinham, Alnwick*	86 19 0

[Estimate, £120]

For Watermain Extensions.

Reavell Bros	£99 17 4
Wilkin & Dickman, Alnwick*	87 2 0

[Estimate, £100]

ARTINGTON.—For new council school, Artington, for Surrey Education Committee. Messrs. A. Wickham Jarvis, A.R.I.B.A., and Frank A. Richards, M.A., Architects to the Committee, 36, Victoria-street, London, S.W.:—

King & Son	£1,969	Martin Wells & Co., Ltd.	£1,730
E. Potterton	1,942	G. Kemp	1,729
Wood & Son	1,934	Tribe & Robinson	1,721
A. Johnson	1,825	Drowley & Co.	1,717
Goddard & Sons	1,813	Mitchell Bros.	1,533
T. J. Hawkins & Co.	1,803		
S. Ellis	1,738		

BARNSTAPLE.—For constructing a new sewer at the rear of the north side of Fort-street, for the Town Council. Mr. E. Y. Saunders, Borough Surveyor, The Strand, Barnstaple:—

G. Hancock	£99 0 0	W. Carter	£45 10 0
J. Barwick	52 17 8	S. Saunders*	38 0 0
W. Dear	51 16 10		

[All of Barnstaple.]

CAVAN.—For erecting a new town hall, for the Urban District Council. Mr. W. A. Scott, A.R.I.B.A., 45, Mountjoy-square, Dublin:—

J. McGennis	£3,388 0	R. Thompson	£2,985
T. McQuirk	3,350 0	W. Callaghan & Sons, Maralin, Lurgan*	2,688
R. Colhoun	3,330 0		
J. Harvey	3,248 17		

DYFFRYN (Goodwick).—For erecting forty houses, for Goodwick Building Club. Mr. H. Thomas, architect and surveyor, 9, Victoria-place, Haverfordwest:—

Nicholas Bros. & Griffiths, Contractors, Goodwick, Pembrokeshire*	£8,950

ENFIELD WASH.—For the erection of a grocery warehouse, etc., Mandeville-road, Enfield Wash, for the Enfield Highway Co-operative Society, Ltd. Mr. Frank Bethell, architect, 23, Queen Anne's-place, Bush Hill Park, N.:—

E. W. Newman	£653 0	Jennings & Grenfell	£618 10
W. Lawrence & Son	650 0	Lane & Harvey*	614 0
P. Paul	625 0	R. Archer	558 10

ESSINGTON.—For sewerage and sewage disposal, for the Cannock Rural District Council. Mr. H. M. Whitehead, engineer, Penkridge, Stafford:—

H. H. Barry	£2,536 5 3
R. C. Brebner & Co	2,287 5 3
Lock, Andrews, & Price	2,150 9 7
G. Law	2,127 0 0
J. A. Meredith	1,992 0 0
Firth & Co.	1,905 5 11
J. & F. Wootton	1,864 14 3
Johnson Bros.	1,856 14 9
G. P. Trentham	1,853 0 0
Ward & Tetley	1,852 0 0
W. H. Reading	1,798 0 0
J. Owens	1,769 0 0
F. Barke	1,630 17 0
Barker Bros.	1,615 0 0
H. Holloway, Wolverhampton*	1,594 12 7

FLINT.—For erecting new council school for 350 children, for Flintshire Education Committee. Mr. Samuel Evans, County Surveyor, County Buildings, Mold. Quantities by Samuel Evans, County Surveyor:—

W. H. Thomas	£4,743 1 5	P. Edwards	£4,297 0 0
J. T. Jones	4,670 0 0	H. Kelly & Bros.	4,273 0 0
R. Williams	4,600 0 0	G. Wright & Sons	4,245 0 0
T. G. Huxley	4,500 0 0	A. B. Lloyd, Halkyn-street, Flint*	4,150 0 0
M. S. Rogers	4,373 4 5		
P. Williams	4,300 0 0		

[County Surveyor's estimate, £4,252.]

GRIMSBY.—For public convenience, Riby-square. Mr. H. Gilbert Whyatt, A.M.Inst.C.E., Borough Engineer and Surveyor, Town Hall, Grimsby:—

Buildings.

W. H. Allison	£975 0 0	J. A. Thomas	£845 0 0
W. Ion	941 14 9	Holmes & Richardson	835 0 0
R. G. Kitching	935 0 0	W. Gilbert, Grimsby*	823 5 0
Hewins & Goodhand	923 0 0	W. Kirton‡	790 0 0
C. Greenwood	858 11 2		

‡ Withdrawn.

Fittings.

	Fittings Fixed Complete as per Bill of Quantities.	Fittings Delivered only at a Railway Station in Grimsby.
G. Jennings, Ltd.	£248 10 0	£203 10 0
J. Duckett & Son	227 0 0	207 0 0
Doulton & Co.	226 10 9	200 0 9
B. Finch & Co.	218 0 0	157 0 0
F. Winkle & Co.	213 4 0	178 14 0
T. B. Redshaw	194 6 0	—
Adamsez, Ltd.	193 15 4	158 15 4
D. J. Dolby	188 10 0	—
Mellowes & Co.	182 0 0	161 0 0
Morrison, Ingram, & Co.	177 0 0	—
W. G. Padgett	171 0 0	—
W. E. Farrer	170 0 0	145 0 0
Twyfords, Ltd.	167 5 0	134 15 0
Oates & Green, Halifax*	159 11 0	—

FRIMLEY.—For the new council school, Frimley, for Surrey Education Committee. Messrs. A. Wickham Jarvis, A.R.I.B.A., and Frank A. Richards, M.A., Architects to the Committee, 36, Victoria-street, London, S.W.:—

A. G. Mardon	£2,605	J. Burges & Sons	£2,374
R. T. Hughes & Co., Ltd.	2,490	Crosby & Co.	2,365
Tompsett & Co	2,475	Goddard & Sons	2,301
Cæsar Bros.	2,445	G. Kemp	2,269
E. Kemp	2,434	Martin Wells & Co., Ltd.*	2,241
T. J. Hawkins & Co.	2,396		

HARPENDEN.—For surface-water drain and for concrete retaining wall, Grove-road, for the Urban District Council. Mr. John H. Leverton, Surveyor:—

E. E. Cousins	£300 0 6	W. Abbott	£183 18 0
Wallace & Inns	253 6 6	E. C. Jarvis	183 0 0
T. W. Pedrette	190 11 6	G. Powdrill	176 16 0
F. Osenton	185 6 0	H. Williams	175 16 6

[Surveyor's estimate, £171 10.]

HARROGATE.—For the erection at the Royal Baths of a hot water tank, for the Corporation. Mr. F. Bagshaw, Borough Engineer, Municipal Offices, Harrogate:—Holdsworth &, Sons, Croft Boiler Works, Bradford* £222

HIRAEL.—For alterations and decorating the Hirael chapel and schoolrooms, for the Building Committee. Mr. L. Osborne Williams, architect, "The Woodlands," Bangor, and 14, Cook-street, Liverpool:—

R. & J. Williams, Park-street, Upper Bangor*	£227 5

HORNE.—For new council school, Horne, for Surrey Education Committee. Messrs A. Wickham Jarvis, A.R.I.B.A., and Frank A. Richards, M.A., Architects to the Committee, 36, Victoria-street, London, S.W.:—

Head Bros.	£2,387 0	Martin Wells & Co., Ltd.	£1,919 0
T. E. Dives	2,252 0	R. T. Hughes, & Co., Ltd.	1,877 0
W. & S. Wallis	2,196 0	R. Jones & Son	1,807 10
E. G. Stanford	2,116 0	T. J. Hawkins & Co	1,806 0
G. Kemp	2,038 0	Goddard & Sons*	1,774 0
King & Son	2,018 0		
Mitchell Bros.	1,998 0		

KESSINGLAND.—For extension of sewerage scheme, for the Mutford and Lothingland Rural District Council. Mr. S. G. Bloy, Surveyor, Oulton Broad:—

F. Rushmere	£160 0 0	W. J. Scarle, Oulton Broad*	£95 17 6
W. Church	117 15 0		
A. G. Beckett	110 0 0		

KING'S HEATH.—For extensions and alterations at the King's Heath depot, for the King's Norton and Northfield Urban District Council. Mr. A. W. Cross, Surveyor, 23, Valentine-road, King's Heath:—

W. J. Morris	£336 0 0	G. Robinson & Son	£288 17 0
F. Davis	310 0 0	A. Curson, King's Heath, Birmingham*	269 3 1
G. T. Stopher	309 0 0		
T. A. Smith	297 0 0		
G. Webb & Son	293 0 0		
W. H. Gibbs	290 0 0		

KING'S HEATH.—For the erection of a steel and galvanised iron cartshed at the King's Heath depot, for King's Norton and Northfield Urban District Council. Mr. A. W. Cross, A.M.Inst.C.E., Surveyor, 23, Valentine-road, King's Heath:—

J. Ash & Son	£224 0	E. Hadley & Sons	£153 0
E. C. & J. Keay, Ltd.	195 0	J. Ewell, Phœnix Ironworks, Birmingham*	150 10
J. McManus	192 10		
W. H. Smith	165 0		
Hill & Smith	153 0		

KING'S HEATH.—For the construction of a sewer in Taylor-road, May-lane, and Haunch-lane, King's Heath, for King's Norton and Northfield Urban District Council. Mr. A. W. Cross, Surveyor, 23, Valentine-road, King's Heath:—

J. White, jun.	£1,341 19 6
Sutherland & Thorpe	1,197 18 10
Currall, Lewis, & Martin, Ltd.	1,126 6 2
G. P. Trentham	1,075 0 0
F. Osenten, Staines, Middlesex*	852 18 3
T. H. Harper	823 0 0

LONDON.—For making up a portion of the roadway of Edinburgh-road, North Kensington, for the Royal Borough of Kensington:—

H. Boyer	£199 0	E. Rogers & Co., Ltd., 6, St. Lawrence-road, North Kensington*	£150 0
W. Shepherd & Sons	167 2		
W. Griffiths & Co., Ltd.	163 0		
J. Mowlem & Co., Ltd.	150 0		

MANCHESTER.—For the erection of the superstructure from ground level of a warehouse, Dale-street, etc., Manchester, for Mr. J. D. Williams. Mr. R. Argile, architect, Ripley, near Derby. Quantities by the architect:—

J. Booth & Son	£16,175 0 0	R. Carlyle	£14,098 0 0
A. Hodkinson	15,880 0 0	W. Thorpe & Son	13,898 0 0
J. Byrom, Ltd.	15,499 0 0	D. Eadie	13,820 0 0
Kirk & Randall	15,432 0 0	C. H. Normanton & Son.	13,761 0 0
Harris & Hunt	15,134 7 2	W. Brown & Sons	13,700 0 0
W. Townson & Sons, Ltd.	15,120 0 0	J. Gerrard & Sons, Ltd., Swinton, Manchester*	13,697 0 0
Young, Tinker, & Young	14,727 0 0		
R. Neill & Sons	14,660 0 0		
G. Macfarlane & Sons	14,650 0 0		
Burgess & Galt	14,485 0 0		
W. A. Peters & Sons	14,298 0 0		

NAAS.—For sewerage works, for the Urban District Council. Mr. F. Bergin, Engineer, 36, Westmoreland-street, Dublin:—

H. & J. Martin	£5,556 0 0	Grainger Bros.	£4,405 15 1
J. Kennedy	5,100 10 0	Collen Bros.	4,100 0 0
Bairds, Ltd.	4,579 3 9	D. Clark	3,996 6 10
Hegarty & Gault	4,571 9 3	G. Langley	3,978 0 0
P. Blake	4,490 0 0	P. Ritchie	3,971 6 0
W. A. Beck	4,471 0 0	Fleming Bros., Portrush*	3,832 12 1
J. Graham	4,451 5 0		

[Engineer's estimate, £3,964.]

NEWARK.—For erecting new secondary school for 150 boys, London-road, for the Governors. Messrs. Sheppard & Lockton, architects, Bargate, Newark:—

G. Brown & Sons, Newark*	£9,315

NEWCASTLE (Staffs).—For additions and alterations to the Middle Boys' school, for the Governors of the Newcastle-under-Lyne Endowed schools. Messrs. A. R. Wood & Son, architects, Tunstall and Burslem :—

T. Rhodes	£1,711	H. E. Emery	£1,128
Grant & Sons	1,180	J. Pooie, Newcastle*	1,099
S. Wilton	1,157	J. Grant	1,094

PORTSMOUTH.—For new block to contain two children's wards, with sanitary spurs and balconies, for the Royal Portsmouth, Portsea, and Gosport Hospital. Mr. C. W. Ball, architect and surveyor, Whittington-chambers, King's-road, Southsea :—

J. Brittan	£6,988 0 0	J. Crockerell	£5,606 0 0
Billett & Musselwhite	6,480 2 10	W. R. Light & Son	5 382 0 0
W. W. Evans	6,300 0 0	F. J. Privett	5,374 0 0
E. & A. Sprigings	6,159 0 0	W. Learmouth	5,346 0 0
J. Croad	5,850 0 0	M. Coltherup, Portsmouth*	5,320 0 0
H. Jones	5,621 0 0		

SOUTHALL.—For "dock" at Adelaide estate, for Southall-Norwood Urban District Council. Mr. Reginald Brown, Engineer and Surveyor, Public Offices, Southall :—

Pettrick Bros.	£2,644 0 0‡
W. Brown & Sons	1,747 0 0
R. C. Brebner & Co.	1,649 7 8
J. Cochrane & Sons	1,521 8 3
T. Watson, Jun.	1,359 0 0
Kellett's, Ltd.	1,358 7 0
B. G. Somerville & Co.	1,250 0 0
A. McKenzie	1,223 10 0
Pedrette & Co.	1,206 13 10
E. Plaistowe	1,199 0 0
J. Dickson	1,175 0 0
G. Munday & Sons	1,164 0 0
Middlesex Contracting Co.	1,134 0 0
Jarman, Dawes & Co.	1,098 0 0
Kirk & Randall	1,028 0 0
C. Ford	1,023 0 0
A. T. Catley	1,008 0 0
Muirhead & Co.	999 0 0
Thomas & Thomas	998 10 5
Jackannann & Co.	930 0 0
O. Senton	874 16 3
A. & B. Hanson, Southall*	849 0 0‡

[Engineer's Estimate, £1,047.]

SOUTHALL.—For dam at the dock, Adelaide Estate, Southall, for the Norwood Urban District Council. Mr. R. Brown, Engineer and Surveyor, Public Offices, Southall :—

	Dam.	Maintenance per 4 weeks.
A. McKenzie, Balham*	£70 0	£10
Cochrane & Sons	65 0	36
Muirhead & Co.	105 0	15
E. Plaistowe	35 0	84
Waghorn	87 0	30
Kellets, Ltd.	100 0	25
A. Fasey & Son	200 0	50
J. Dickson	155 10	35
Thomas & Thomas	30 0	84
Sangwin	100 0	—

SUTTON COLDFIELD.—For erecting a school in Hollyfield-road, for the Corporation. Messrs. Crouch, Butler, & Savage, Architects, 39, Newhall-street, Birmingham :—

R. Fenwick, Ltd.	£2,195 0	J. Bird	£1,875 0
F. L. Jones	2,095 0	T. Elvins	1,870 0
Lee & Son	1,995 0	Ingram & Son	1,849 0
Moorhouse&Sons	1,984 0	R. Cleaver	1,840 0
G. T. Stephens	1,900 0	Turville & Son	1,840 0
W. H. James	1,897 0	I. Langley, Tyburn, near Birmingham*	1,819 0
A. C. Hughes	1,896 0		
H. Williams	1,890 0		
G. Good	1,889 14	G. F. Swift	1,800 0
Barnsley & Son	1,888 0	G. Webb & Son	1,797 0
T. Higgs	1,880 0	T. Johnson	1,687 0

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SWINDON.—For work in connexion with the erecting of balcony and verandah to the Victoria Hospital, Swindon. Messrs. Ainsworth & Pilcher, architects, Central-chambers, Swindon :—

Tydeman Bros.	£140 0 0	R. J. Leighfield	£125 0 0
J. G. Norman	135 14 0	G. Kilminster	123 18 0
Spackman Bros.	133 0 0	J. Lay*	120 16 6

[All of Swindon.]

Walter Macfarlane & Co. secured the contract for the balcony and verandah.

TOOTING BEC.—For cleaning and painting works at Tooting Bec Asylum, S.W., for the Metropolitan Asylum Board. Mr. W. T. Hatch, Engineer-in-Chief :—

F. T. Bruton & Sons	£4,748 0 0‡
Markham & Markham	4,187 0 0
W. Payne	4,019 0 0
J. Long	3,897 10 2
C. W. Bovis & Co.	3,835 0 0
A. Roberts & Co., Ltd.	3,800 0 0
J. Lawrance	3,585 0 0
W. Johnson & Co., Ltd.	3,398 0 0
Patman & Fotheringham, Ltd.‡	3,239 0 0
A. Black & Son	3,108 0 0
E. Burns & Co.	3,034 16 11
J. C. Mather	2,938 0 0
J. W. Jerram	2,934 0 0
Wood Bros.	2,928 5 0
M. A. King	2,923 17 0
W. Rice & Sons	2,879 18 11
W. Dudley	2,823 0 0
R. Woollaston & Co.	2,802 12 8
D. T. Bostel & Sons	2,790 0 0
E. Proctor & Son	2,600 0 0
B. & A. Gale	2,589 0 0
W. Hussey	2,487 0 0
A. F. Vigor & Co.	2,470 0 0
J. J. Richards	2,462 8 1
Jones Bros.	2,397 0 0
W. J. Simms & Sons	2,395 0 0
Vigor & Co.	2,392 0 0
J. Hocking & Co.	2,087 0 0
A. H. Inns	2,082 0 0
L. Kazak	1,944 2 3
M. McCarthy, Heidelberg, King's-avenue, Clapham Park, S.W.*	1,716 0 0‡

‡ Informal.

TUNBRIDGE WELLS.—For private street works, part of Erskine Park-road, for the Borough Council. Mr. W. H. Maxwell, Borough Engineer and Surveyor, Town Hall, Tunbridge Wells :—

W. H. Wheeler, London* £837 1 2

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